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FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE REPORT

HARMONY WEST WITS RECLAMATION

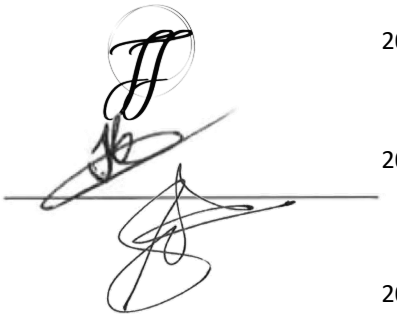


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EXECUTIVE SUMMARY

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant) is the holder of a mining right for gold in Carletonville ((GP) 30/5/1/1/2/07MR). This Financial Provision Report has been prepared in terms of the National Environmental Management Act, 1998 (NEMA) and the Financial Provisioning Regulations, 2015 (GN R 1147), and comprises a Final Rehabilitation, Decommissioning and Closure Plan (FRDCP), an Annual Rehabilitation Plan (ARP) and an Environmental Risk Assessment (ERA) report.

The closure vision for the operation is to return the disturbed footprint to a safe, stable, non-polluting and self-sustaining landform that supports the agreed post-mining land use of grazing, that requires no ongoing active management once the aftercare period is complete, and that does not transfer an unfunded environmental or social liability to the State, the landowner or the surrounding community.

The primary closure actions are:

- Capping and revegetation of the Deelkraal II TSF to a free-draining, erosion-resistant final landform of approximately 430 ha;
- removal of the reclaimed dormant Deelkraal I and Kusasalethu TSF footprints, with stripping or treatment of residual contaminated footprint material, ripping, topsoiling and revegetation;
- dismantling and removal of the reclamation pump stations, plant upgrades, slurry and process water pipelines, powerlines and ancillary infrastructure, and rehabilitation of the servitudes and access roads;
- decommissioning of the three return water dams (the main Return Water Dam, RWD2 and RWD3) and the stormwater management works, and reinstatement of the clean and dirty water separation to the pre-development drainage regime; and
- maintenance, monitoring and aftercare of the rehabilitated areas until the relinquishment criteria in Section 2.23 are demonstrated.

The proposed post-mining land use is grazing, consistent with the pre-mining land capability of the underlying land type and with the surrounding land use. Post-closure land use per rehabilitation domain is set out in Section 2.18. The closure cost estimate and quantum of financial provision were determined in line with the Department of Mineral Resources and Energy 'Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' (the DMR Guideline) by MineLock Environmental Engineers (Pty) Ltd (MineLock, 2026; Appendix 1).

Quantum of financial provision (September 2026), taken as one year into construction: R61 217 472.05 (incl. VAT).

1 INTRODUCTION

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant) is the holder of a mining right for gold in Carletonville ((GP) 30/5/1/1/2/07MR). The applicant is applying for an environmental Authorisation (EA) for a proposed new West Wits Reclamation and Deposition Project. The West Wits project consists of the proposed Deelkraal II Tailings Storage Facility (TSF) and associated infrastructure on a site located approximately 13km southwest of Carletonville in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province.

This report is prepared in support of an application for an environmental authorisation (EA) and must be read together with the operation's Environmental Impact Assessment report (EIAR) / Basic Assessment Report (BAR) and Environmental Management Programme (EMPr). It is included as Appendix F (Final Decommissioning, Rehabilitation and Closure Plan) of the EIA Report

1.1 SCOPE OF REPORT

In accordance with Section 24P of NEMA, the Holder must, before the Minister responsible for mineral resources issues a decision on the environmental authorisation, make prescribed financial provision for the rehabilitation, closure and ongoing post-decommissioning management of negative environmental impacts. GN R 1147 requires that financial provision be made for:

- annual rehabilitation, set out in an Annual Rehabilitation Plan (ARP), NEMA GN R1147 - Appendix 3 (Section 3 of this report);
- final rehabilitation, decommissioning and closure at the end of operations set out in a Final Rehabilitation, Decommissioning and Closure Plan (FRDCP), NEMA GN R1147 - Appendix 4 (Section 2 of this report); and
- remediation and management of latent or residual environmental impacts which may become known in the future , set out in an Environmental Risk Assessment (ERA) report, NEMA GN R1147 - Appendix 5 (Section 4 of this report).

1.2 DETAILS OF SPECIALISTS

Environmental Impact Management Services (Pty) Ltd (EIMS) was appointed by Harmony to develop the Financial Provision (FP) report inclusive of the Annual Rehabilitation Plan (ARP), Final Rehabilitation, Decommissioning and Closure Plan (FRDCP) and the Environmental Risk Assessment (ERA). The DMR closure quantum was determined by MineLock Environmental Engineers (Pty) Ltd, appointed by EIMS (MineLock, 2026; Appendix 1). The details of the professionals who contributed to the preparation of this report is provided in Table 1 below. Detailed CVs are available upon request.

Table 1: Details of Specialists.

Name	Role	Qualifications / Experience	Professional Registrations
Liam Whitlow	Environmental Consultant	BSc Hons Environmental Management. ~25 years environmental consulting experience.	South African Council for Natural Scientific Professions - Registered Professional Natural Scientist (Environmental Science, 400148/08). Registered Environmental Assessment Practitioner (2019/222). Member of Land Rehabilitation Society of Southern Africa.

Name	Role	Qualifications / Experience	Professional Registrations
Jessica Jordaan	Environmental Consultant	BSc in Geology and BSc Hons in Soil Science. ~5 years in soil science and environmental consulting experience	South African Council for Natural Scientific Professions - Registered Candidate Natural Scientist (Soil Science, 124758). Registered Candidate Environmental Assessment Practitioner (2023/7087). Member of Land Rehabilitation Society of Southern Africa.
Douglas Richards	Civil Engineer, MineLock Environmental Engineers (Pty) Ltd: DMR closure quantum	Tshwane University of Technology. Bachelor's degree Civil Engineering Civil engineer with specialized expertise in landform design, mine rehabilitation and closure planning,	Engineering Council of South Africa: Professional Engineering Technologist (Pr.Tech.Eng.) 2025302457

2 SECTION A: FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE

The FRDCP must be measurable and auditable, must take into consideration the proposed post-exploration end use of the affected area and must contain information that is necessary for the definition of the closure vision, objectives and design and relinquishment criteria, indicating what infrastructure and activities will ultimately be decommissioned, closed, removed and remediated and the risk drivers determining actions, indicating how the closure actions will be implemented to achieve closure relinquishment criteria and indicating monitoring, auditing and reporting requirements. Table 2 lists the requirements of the FRDCP as per the NEMA GN R 1147, Appendix 4.

The plan must detail:

- Infrastructure and activities to be decommissioned, closed, removed, or remediated;
- Risk factors driving closure actions;
- The methodology for implementing closure actions to meet relinquishment criteria; and
- Requirements for monitoring, auditing, and reporting progress

The primary objective of this FRDCP is to establish a clear, measurable, and auditable framework for the post-mining land use. This framework will:

- Define the vision: Provide a comprehensive vision, objectives, targets, and criteria for the final rehabilitation, decommissioning, and closure of the project.
- Establish design principles: Outline the fundamental design principles that will guide the closure process.
- Conduct risk assessment: Conduct a thorough risk assessment, identify potential risks, and link closure activities to risk mitigation strategies.
- Detail closure actions: Specify the precise actions required to mitigate and/or manage identified risks and outline the nature of residual risks that will necessitate post-closure monitoring and management.
- Develop implementation plan: Establish a detailed implementation plan, including a schedule, budget, and assignment of roles and responsibilities for each relevant activity or infrastructure item.
- Identify knowledge gaps: Acknowledge any knowledge gaps and outline strategies to address and fill them.
- Estimate closure costs: Provide a comprehensive estimate of the full closure costs for the project's lifecycle, with increasing accuracy as the project progresses and the final land use becomes more defined.
- Establish monitoring and reporting: Outline the specific monitoring, auditing, and reporting requirements to ensure compliance with regulatory standards and the effective implementation of the closure plan.

Table 2: NEMA GNR 1147 Final Rehabilitation, Decommissioning and Closure Plan requirements.

No.	Requirement	Section
3(a)	Details of- (i). the person or persons that prepared the plan;	Section 1.2 (Details of Specialists), read with Table 1.



No.	Requirement	Section
	(ii). the professional registrations and experience of the preparers;	
3(b)	The context of the project, including- (i). material information and issues that have guided the development of the plan; (ii). an overview of- (aa) the environmental context, including but not limited to air quality, quantity and quality of surface and groundwater, land, soils and biodiversity; and (bb) the social context that may influence closure activities and post-mining land use or be influenced by closure activities and post-mining land use; (iii). stakeholder issues and comments that have informed the plan; (iv). the mine plan and schedule for the full approved operations, and must include- (aa) appropriate description of the mine plan; (bb) drawings and figures to indicate how the mine develops; (cc) what areas are disturbed; and (dd) how infrastructure and structures (including ponds, residue stockpiles etc.) develop during operations;	Material information and issues: Section 2.1. Mine plan, schedule and development drawings: Section 2.1.2, read with Table 3 and Figures 1 to 5. Environmental context: Sections 2.2 to 2.14. Social context: Section 2.15. Stakeholder issues and comments: Section 2.15, read with the Comments and Responses Report in the EIAR.
3(c)	Findings of an environmental risk assessment leading to the most appropriate closure strategy, including- (i). a description of the risk assessment methodology including risk identification and quantification, to be undertaken for all areas of infrastructure or activity or aspects for which a holder of a right or permit has a responsibility to mitigate an impact or risk at closure; (ii). an identification of indicators that are most sensitive to potential risks and the monitoring of such risks with a view to informing rehabilitation and remediation activities; (iii). an identification of conceptual closure strategies to avoid, manage and mitigate the impacts and risks; (iv). a reassessment of the risks to determine whether, after the implementation of the closure strategy, the residual risk has been avoided and / or how it has resulted in avoidance, rehabilitation and management of	Methodology: Section 2.16.1. Specialist findings and sensitive indicators: Section 2.16.2 (Table 27). Identified risks, conceptual closure strategies and reassessment: Section 2.16.3 (Table 28). Residual and latent risks: Section 4.2 (Table 42). Changes in annual updates: Section 2.22.



No.	Requirement	Section
	impacts and whether this is acceptable to the mining operation and stakeholders; and (v). an explanation of changes to the risk assessment results, as applicable in annual updates to the plan;	
3(d)	Design principles, including- (i). the legal and governance framework and interpretation of these requirements for the closure design principles; (ii). closure vision, objectives and targets, which objectives and targets must reflect the local environmental and socio-economic context and reflect regulatory and corporate requirements and stakeholder expectations; (iii). a description and evaluation of alternative closure and post closure options where these exist that are practicable within the socioeconomic and environmental opportunities and constraints in which the operation is located; (iv). a motivation for the preferred closure action within the context of the risks and impacts that are being mitigated; (v). a definition and motivation of the closure and post closure period, taking cognisance of the probable need to implement post closure monitoring and maintenance for a period sufficient to demonstrate that relinquishment criteria have been achieved; (vi). details associated with any on-going research on closure options; (vii). a detailed description of the assumptions made to develop closure actions in the absence of detailed knowledge on site conditions, potential impacts, material availability, stakeholder requirements and other factors for which information is lacking;	Legal and governance framework: Sections 2.17.1 and 2.17.2. Closure vision, objectives and targets: Section 2.17.3 (Table 30). Alternatives: Section 2.17.4. Motivation for the preferred options: Section 2.17.5. Closure and post-closure period: Section 2.17.6. Ongoing research and assumptions: Section 2.17.7, read with Section 2.24.3.
3(e)	A proposed final post-mining land use which is appropriate, feasible and possible of implementation, including- (i). descriptions of appropriate and feasible final post-mining land use for the overall project and per infrastructure or activity and a description of the methodology used to identify final post-mining land use, including the requirements of the operations stakeholders;	Section 2.18 (Table 31). [Map of the proposed final post-mining land use still to be added.]



No.	Requirement	Section
	(ii). a map of the proposed final post-mining land use;	
3(f)	closure actions, including- (i). the development and documenting of a description of specific technical solutions related to infrastructure and facilities for the preferred closure option or options, which must include all areas, infrastructure, activities and aspects both within the mine lease area and off of the mine lease area associated with mining for which the mine has the responsibility to implement closure actions; (ii). the development and maintenance of a list and assessment of threats and opportunities and any uncertainties associated with the preferred closure option, which list will be used to identify and define any additional work that is needed to reduce the level of uncertainty;	Closure actions by domain and phase: Section 2.19 (Table 32), read with Section 2.24.2 for the battery limits. Threats, opportunities and uncertainties: Sections 2.17.7 and 2.22, read with Section 4.2 (Table 42).
3(g)	A schedule of actions for final rehabilitation, decommissioning and closure which will ensure avoidance, rehabilitation, management of impacts including pumping and treatment of extraneous water - (i). linked to the mine works programme, if greenfields, or to the current mine plan, if brownfields; (ii). including assumptions and schedule drivers; and (iii). including a spatial map or schedule, showing planned spatial progression throughout operations;	Section 2.20 (Table 33), read with Section 2.1.2 for the mine plan.
3(h)	An indication of the organisational capacity that will be put in place to implement the plan, including- (i). organisational structure as it pertains to the plan; (ii). responsibilities; (iii). training and capacity building that may be required to build closure competence;	Section 2.21.
3(i)	An indication of gaps in the plan, including an auditable action plan and schedule to address the gaps;	Section 2.22, read with Section 2.17.7.
3(j)	Relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators;	Section 2.23, read with Table 30 (Section 2.17.3).
3(k)	Closure cost estimation procedure, which ensures that identified rehabilitation, decommissioning, closure and post-closure costs, whether on-going or once-off, are	Methodology: Section 2.24.1 (Table 34). Battery limits: Section 2.24.2 (Table 35). Assumptions: Section 2.24.3. Unit rates:



No.	Requirement	Section
	realistically estimated and incorporated into the estimate, on condition that- (i). cost estimates for operations, or components of operations that are more than 30 years from closure will be prepared as conceptual estimates with an accuracy of ± 50 per cent. Cost estimates will have an accuracy of ± 70 per cent for operations, or components of operations, 30 or less years (but more than ten years) from closure and ± 80 per cent for operations, or components of operations ten or less years (but more than five years) from closure. Operations with 5 or less years will have an accuracy of ± 90 per cent. Motivation must be provided to indicate the accuracy in the reported number and as accuracy improves, what actions resulted in an improvement in accuracy; (ii). the closure cost estimation must include- (aa) an explanation of the closure cost methodology; (bb) auditable calculations of costs per activity or infrastructure; (cc) cost assumptions; (iii). the closure cost estimate must be updated annually during the operation's life to reflect known developments, including changes from the annual review of the closure strategy assumptions and inputs, scope changes, the effect of a further year's inflation, new regulatory requirements and any other material developments; and	Section 2.24.4 (Table 36). Calculations per component: Section 2.24.5 (Table 37). Quantum: Section 2.24.6. DMR closure costing: Appendix 1.
3(I)	Monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps as a minimum and must include- (i). a schedule outlining internal, external and legislated audits of the plan for the year, including- (aa) the person responsible for undertaking the audit(s); (bb) the planned date of audit and frequency of audit; (cc) an explanation of the approach that will be taken to address and close out audit results and schedule; (ii). a schedule of reporting requirements providing an outline of internal and external reporting, including disclosure of updates of the plan to stakeholders;	Section 2.25: audit schedule in Table 38; monitoring and reporting plan in Table 39. Post-closure monitoring of latent and residual risks: Section 4.4.



No.	Requirement	Section
	(iii). a monitoring plan which outlines- (aa) parameters to be monitored, frequency of monitoring and period of monitoring; (bb) an explanation of the approach that will be taken to analyse monitoring results and how these results will be used to inform adaptive or corrective management and/or risk reduction activities; and	
3(m)	motivations for any amendments made to the final rehabilitation, decommissioning and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps as per 2(i)	Section 2.22. Not applicable to this first submission: no previous auditing period exists.

2.1 PROJECT CONTEXT

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to assist with compiling the Closure report in support of the EIAR and EA application for the proposed new Deelkraal II Tailings Storage Facility (TSF) project and associated infrastructure.

2.1.1 LOCATION

The proposed project is located approximately 13km southwest of Carletonville in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province (i.e. the Proposed Harmony West Wits Reclamation and Deposition Project).

Table 3 indicates the farm portions that fall within the proposed project including details on the project location as well as the distance from the proposed project area to the nearest towns.

Table 3: Locality details

Application Area (Ha) and Infrastructure extent	• The following areas / footprints and distances are relevant: • Approximately 430 ha for the TSF footprint. • Approximately 13 ha for new main Return Water Dam. • Approximately 3 hectares combined area for two smaller Return Water Dams. • Approximately 30 km of new slurry pipelines (with a 4 m wide servitude) • Approximately 25 km of new process and potable water pipelines (with a 4 m wide servitude) • Approximately 15 km of new 7,5m wide access roads • Approximately 18 km of new powerlines. • Approximately 4 ha combined area for new reclamation pump stations. • Approximately 65 ha for new topsoil / overburden stockpiles. • Approximately 35 ha total for the various associated construction laydown areas. Planned upgrades to the Kusasalethu plant will all be within the existing plant footprint.		
Magisterial District	Merafong City Local Municipality within the West Rand District Municipality (Gauteng Province).		
Distance and direction from nearest towns	The site is approximately 13km southwest of Carletonville. The geographic coordinates at the centre of the proposed Deelkraal II TSF site are 26°28'10.51"S, 27°16'56.07"E.		
	Farm Name:	**Portion:**	**21 Digit Surveyor General Code**

Property Details	Deelkraal II TSF and associated reclamation pump station, RWDs and associated laydown areas and roads around TSF Centre point: 26°27'58.21"S, 27°17'32.72"E.		
	Kleinfontein 141 IQ	2	T0IQ00000000014100002
	Kleinfontein 141 IQ	4	T0IQ00000000014100004
	Kleinfontein 141 IQ	5	T0IQ00000000014100005
	Kleinfontein 141 IQ	6	T0IQ00000000014100006
	Deelkraal 142 IQ	23	T0IQ00000000014200023
	Deelkraal 142 IQ	3	T0IQ00000000014200003
	Deelkraal 142 IQ	59	T0IQ00000000014200059
	Deelkraal 142 IQ	60	T0IQ00000000014200060

Additional Associated Infrastructure: pipelines & powerlines, access roads, topsoil stockpiles, additional laydown areas and pump stations

New Process Water Pipelines:

Process Water Feed to Deelkraal Reclamation

Start: 26°27'22.37"S, 27°21'26.43"E

Middle: 26°26'37.70"S, 27°19'45.69"E

End: 26°27'29.40"S, 27°16'38.62"E

Process Water Feed to Kusasalethu Process Water Tank

Start: 26°27'30.82"S, 27°16'47.64"E

Middle: 26°26'55.21"S, 27°19'34.04"E

End: 26°27'22.29"S, 27°21'25.89"E

DP3 to North Boundary Dam

Start: 26°23'49.17"S, 27°25'58.07"E

Middle: 26°24'52.03"S, 27°25'40.75"E

End: 26°24'45.98"S, 27°24'25.98"E

DP3 feed to Tau Tona RO Plant

Start: 26°24'47.62"S, 27°25'44.70"E

Middle: 26°24'48.26"S, 27°25'45.71"E

End: 26°24'49.05"S, 27°25'46.90"E

Nursery Pumpstation #3 to Kusasalethu Proces Water Tank

Start: 26°24'50.97"S, 27°24'25.62"E

Middle: 26°25'41.64"S, 27°22'16.40"E

End: 26°27'22.29"S, 27°21'26.33"E

2 x Process Water Pipelines Kusasalethu to Savuka White Tanks

Start: 26°27'22.27"S, 27°21'26.09"E

Middle: 26°26'4.20"S, 27°21'56.26"E

End: 26°25'24.05"S, 27°23'59.57"E

New Slurry Pipelines:

Reclaimed Slurry from Deelkraal I to Kusasalethu

Start: 26°27'29.83"S, 27°16'39.32"E

Middle: 26°26'48.69"S, 27°19'7.82"E

End: 26°27'25.95"S, 27°21'37.98"E

Kusasalethu Barren Tailings to Deelkraal II

Start: 26°27'24.44"S, 27°21'29.53"E

Middle: 26°26'48.69"S, 27°19'7.82"E

End: 26°27'51.94"S, 27°17'20.31"E

Reclaimed Slurry Kusasalethu TSF - Kusasalethu Plant

Start: 26°28'12.30"S, 27°21'45.85"E

Middle: 26°27'44.69"S, 27°21'46.67"E

End: 26°27'22.17"S, 27°21'39.17"E

Savuka Plant to DF5 TSF

Start: 26°25'17.30"S, 27°23'51.83"E

Middle: 26°24'56.58"S, 27°24'13.22"E

End: 26°24'12.61"S, 27°24'28.45"E

Slurry pipeline from Kusasalethu Plant to Savuka TSF

Start: 26°27'21.89"S, 27°21'29.50"E

Middle: 26°26'46.51"S, 27°21'29.25"E

End: 26°26'10.81"S, 27°20'56.45"E

New Potable Water Pipeline:

Start: 26°26'58.81"S; 27°21'15.10"E

Middle: 26°26'51.58"S,27°19'0.95"E

End: 26°27'28.87"S, 27°16'38.14"E

New Powerlines:

Kusasalethu Plant to Deelkraal

Start: 26°27'23.38"S, 27°21'33.53"E

Middle: 26°26'50.14"S, 27°19'9.04"E

End: 26°27'29.55"S, 27°16'38.94"E

Kusasalethu plant - Kusasalethu TSF

Start: 26°27'23.38"S, 27°21'33.53"E

Middle: 26°27'47.43"S, 27°21'50.11"E

End: 26°28'12.37"S, 27°21'44.23"E

Savuka shaft – Kusasalethu Plant

aStart: 26°25'27.70"S, 27°24'14.77"E

Middle: 26°25'47.77"S, 27°22'7.33"E

End: 26°27'27.58"S, 27°21'27.59"E

Deelkraal 142 IQ	22	T0IQ00000000014200022
Buffelsdoorn 143 IQ	7	T0IQ00000000014300007
Buffelsdoorn 143 IQ	35	T0IQ00000000014300035

	Doornfontein 118 IQ	1	T0IQ00000000011800001
	Doornfontein 118 IQ	2	T0IQ00000000011800002
	Doornfontein 118 IQ	11	T0IQ00000000011800011
	Doornfontein 118 IQ	12	T0IQ00000000011800012
	Doornfontein 118 IQ	13	T0IQ00000000011800013
	Doornfontein 118 IQ	14	T0IQ00000000011800014
	Doornfontein 118 IQ	25	T0IQ00000000011800025
	Doornfontein 118 IQ	27	T0IQ00000000011800027
	Doornfontein 118 IQ	28	T0IQ00000000011800028
	Buffelsdoorn 143 IQ	1	T0IQ00000000014300001
	Blyvooruitzicht 116 IQ	3	T0IQ00000000011600003
	Blyvooruitzicht 116 IQ	4	T0IQ00000000011600004
	Blyvooruitzicht 116 IQ	6	T0IQ00000000011600006
	Buffelsdoorn 143 IQ	9	T0IQ00000000014300009
	Buffelsdoorn 143 IQ	13	T0IQ00000000014300013
	Buffelsdoorn 143 IQ	31	T0IQ00000000014300031
	Buffelsdoorn 143 IQ	34	T0IQ00000000014300034
	Blyvooruitzicht 116 IQ	5	T0IQ00000000011600005
	Blyvooruitzicht 116 IQ	62	T0IQ00000000011600062
	Blyvooruitzicht 116 IQ	93	T0IQ00000000011600093
	Blyvooruitzicht 116 IQ	100	T0IQ00000000011600100
	Blyvooruitzicht 116 IQ	107	T0IQ00000000011600107
	Driefontein 113 IQ	1	T0IQ00000000011300001
Existing Kusasalethu Plant (to be upgraded) Centre point: 26°27'26.75"S, 27°21'30.90"E			
	Buffelsdoorn 143 IQ	9	T0IQ00000000014300009

	Buffelsdoorn 143 IQ	35	T0IQ00000000014300035

The locality and extent of the proposed TSF and associated infrastructure is shown in Figure 1, and the proposed tailings storage facility and associated pipelines are also shown.

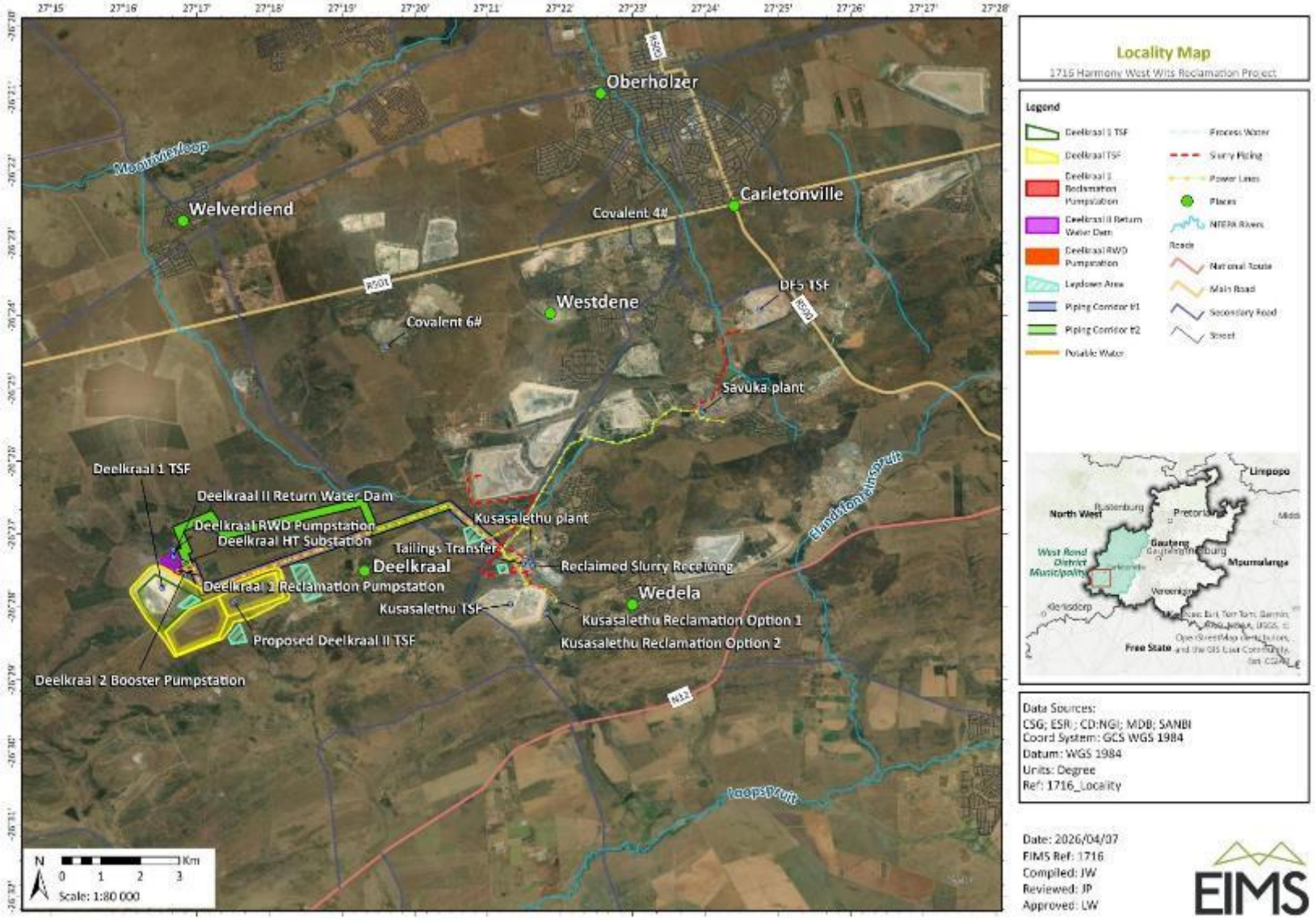


Figure 1: Locality map of the proposed West Wits reclamation project.

2.1.2 MINING OPERATIONS

The Applicant requires additional deposition capacity for West Wits region's operations. The applicant plans on constructing the Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. This TSF will receive residue from Kusasalethu, and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal I TSF and Kusasalethu TSF for processing at Kusasalethu and Savuka plants. Additional planned infrastructure includes various slurry, potable. process and return water pipelines, access roads, power lines, two new reclamation pump stations, a new main return water dam to the northeast of the Deelkraal II TSF as well as two smaller return water dams (RWD2 and RWD3) adjacent to the Deelkraal II TSF to the east and south. Proposed upgrades to the existing Kusasalethu plant (currently under care and maintenance) are also proposed as part of the project.

The Savuka Plant treats tailings from the Savuka Dormant TSFs (Old North TSFs) at a rate of 330 000 tpm and deposits the subsequent tailings on Savuka 5 & 7 TSFs. Harmony plans on remining Deelkraal I Dormant TSF and Kusasalethu TSF amongst other potential future sources. These TSFs will be processed through the Kusasalethu Plant at 500 000 tpm. The planned Life of Mine (LOM) for the West Wits region exceed the available deposition capacity of the existing TSFs. Therefore, additional deposition capacity is required.

The Kusasalethu Plant will accommodate future reclamation operations (specifically Kusasalethu and Deelkraal I TSF will be reclaimed and deposited on Deelkraal II) and will therefore need site/s to deposit the tailings. Harmony owns ground, located adjacent to the Deelkraal I Dormant TSF, that can be used i.e. for the proposed Deelkraal II TSF. The Deelkraal I Dormant TSF and adjacent footprint combined geometry will accommodate the future reclamation operations deposition rate and capacity. The proposed TSF will cover an area of approximately 430 ha as shown in Figure 1.

The West Wits Reclamation (WWR) Concept Study explores ways to unlock the potential of recycling historic gold tailings using the existing Kusasalethu and Savuka process plants and infrastructure. The Concept Study (SGS Bateman, 2024) evaluated different options for the treatment of the Deelkraal I and Kusasalethu Tailings Storage Facilities (TSF) at the existing processing plants. The reworked tailings will be deposited on a new TSF, referred to as Deelkraal II, assumed to be constructed on a site adjacent to the existing Deelkraal TSF. While reviewing the preliminary metallurgy testwork results it became evident that the Deelkraal TSF contained higher grades of accessible gold and it was agreed that that TSF would be reclaimed first, with the Kusasalethu TSF being reclaimed thereafter (SGS Bateman, 2024).

In addition to the Deelkraal II TSF, additional infrastructure is also proposed, as follows:

- A new main Return Water Dam (RWD) in the vicinity of the Deelkraal II TSF;
- Two smaller RWDs due to topography in the vicinity of the Deelkraal II TSF;
- Upgrades to the existing Kusasalethu plant including new/upgrade of gold and new uranium sections;
- Slurry pipelines:
    - Reclaimed Slurry from Deelkraal I to Kusasalethu plant (~10,6km);
    - Kusasalethu Barren Tailings to Deelkraal II (~10,2km);
    - Reclaimed Slurry from Kusasalethu TSF to Kusasalethu Plant (~2km);
    - Slurry pipeline from Kusasalethu Plant to Savuka TSF (~4,97km) enabling treatment of either the Deelkraal 1 or Kusasalethu TSF's; and
    - Slurry pipeline from Savuka plant to DF5 TSF (~2,9km).
- Process Water Pipelines:
    - Process Water Feed from Kusasalethu Plant to Deelkraal I Reclamation (~9.54km)
    - Return Water Feed to Deelkraal I TSF Reclamation station and Kusasalethu Process Water Tank (~9,58km);

- Driefontein DP3 Pump Station to North Boundary Dam (~4,78km);
- DP3 feed to Tau Tona Reverse Osmosis Plant (~0,1km);
- Nursery Pumpstation #3 to Kusasalethu Process Water Tank (~9km); and
- 2 Process Water pipelines from Kusasalethu Plant to Savuka White Tanks (~8km).

- Powerlines (all proposed powerlines will be 22kV or lower):
  - Powerline from Kusasalethu Plant to the existing Deelkraal I and II TSF (~9.2km);
  - Powerline from Kusasalethu Plant to the Kusasalethu TSF (~1.8km); and
  - Powerline from Savuka shaft to Kusasalethu (~8.1km) and or tie into powerline from Kusasalethu Plant to the existing Deelkraal I and II TSF.
- Potable Water pipeline from Rand Water supply point to the Deelkraal TSF (~8.52km).
- Deelkraal I TSF Reclamation Pump Station and Kusasalethu TSF Reclamation Pump Station.
- New Access Roads (2x3,5m double road) adjacent to pipeline routes/OH lines and around Deelkraal II TSF (where no access road is already in place).
- Topsoil Stockpiles and overburden stockpiles.
- Ancillary construction infrastructure including ablutions, workshops and laydown areas, most of which would be temporary and removed at the end of construction.

All pipelines listed above will be flanged steel pipelines installed above-ground on pre-cast concrete plinths (Figure 4) and two 3.5m wide access roads, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections (for areas where no access road is already in place).

The extents of the new infrastructure recorded in the EIA Report (Rev. 1) and Table 3 are approximately: 430 ha for the Deelkraal II TSF; 13 ha for the new main return water dam and 3 ha combined for RWD2 and RWD3; 4 ha combined for the new reclamation pump stations; 65 ha for topsoil and overburden stockpiles; 35 ha for construction laydown areas; 30 km of new slurry pipelines and 25 km of new process and potable water pipelines, each in a 4 m wide servitude; 15 km of new 7.5 m wide access roads; and 18 km of new powerlines. Planned upgrades to the Kusasalethu plant will be within the existing plant footprint.

A Tailings Storage Facility (TSF) is an engineered structure designed to safely contain and manage mining waste, known as tailings. It's not just a simple dam; it's a complex system that includes embankments, associated works, and procedures for managing the tailings and the water they contain. The primary goals of a TSF are to permanently store tailings and reclaim water for reuse in mining operations.

Key aspects related to tailings storage facilities are presented below

1. Tailings Transportation and Deposition:

- Tailings, a slurry of fine rock particles and water, are transported from the processing plant to the TSF, typically via pipelines.
- The tailings are then deposited within the TSF, usually in a controlled manner to allow for the separation of solids and water.

2. Separation of Water and Solids:

- TSFs are designed to facilitate the settling and consolidation of the tailing's solids, allowing water to separate and be reclaimed.
- This separation can occur naturally through gravity or through mechanical processes.
- The reclaimed water is often recycled back into the mining process, reducing water consumption.

3. Embankment Construction and Maintenance:

- TSFs often feature embankments, or "tailings dams," constructed from locally sourced materials, including the tailings themselves.
- These embankments are designed to withstand the weight and pressure of the stored tailings and to prevent leakage or breaches.
- The embankments are typically raised progressively as the TSF fills with tailings.

4. Water Management:

- TSFs must also have systems in place to manage surface water runoff and groundwater infiltration.
- This may involve the use of drainage systems, seepage collection systems, and other measures to prevent uncontrolled water discharge.

5. Monitoring and Closure:

- TSFs are subject to ongoing monitoring to ensure their stability and safety.
- This monitoring may involve remote sensing, on-site inspections, and other techniques.
- At the end of the mine's life, the TSF is decommissioned, and the tailings are typically covered and revegetated to minimize environmental impacts.

Figure 2 below shows a simplified cross-sectional diagram indicating the relevant design features typically associated with a TSF.

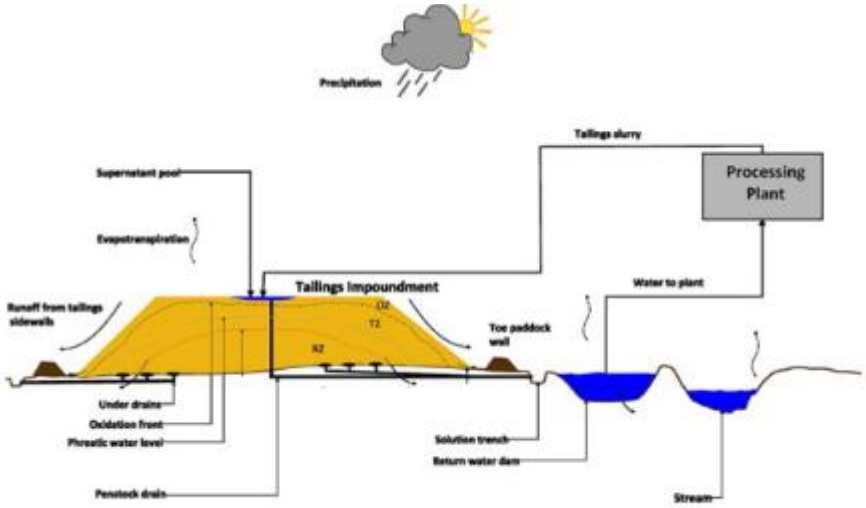


Figure 2: Cross section through a typical TSF

The construction phase of the project will consist of site establishment, site clearance, excavation, topsoil stockpiling, layering and compacting, prior to deposition of tailings at the site. Additional infrastructure such as construction camps, access roads, temporary laydown areas and other associated infrastructure such as pump stations is also required.

The TSF will be constructed in three separate compartments as indicated in the figure below.

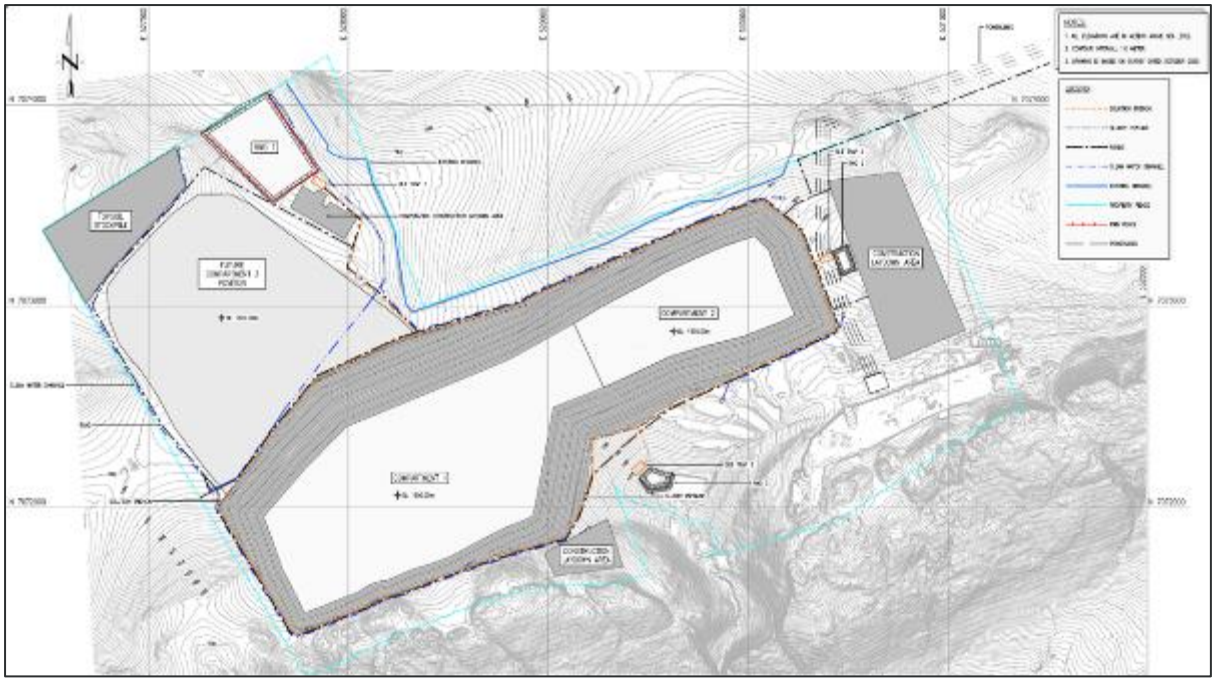


Figure 3: Deelkraal II TSF compartments



Figure 4: Representative image of above-ground pipelines

Key parameters of the Deelkraal II TSF design are as follows:

- Maximum final height: 65m (to be confirmed in detailed design phase).
- Footprint area: Up to 430 Ha (combined total area for all three compartments).
- Total capacity: 192.35 Mt

- Compartment 1 – 80.85 Mt
- Compartment 2 – 53.9 Mt
- Compartment 3 – 57.6 Mt

- Total deposition period at 330 000 tonnes per month for compartment 1[1]: 2028 to 2048 (20 years)
- Total deposition period at 220 000 tonnes per month for compartment 2: 2028 to 2048 (20 years)
- Total deposition period at 300 000 tonnes per month for compartment 3: 2036 to 2039 (4 years)
- Total deposition period at 400 000 tonnes per month for compartment 3: 2040 to 2048 (9 years)
- Maximum rate of rise: 4.98m/year.
- Deposition method: Cyclone.

The following operational activity details are relevant to the current application:

- An underdrainage system is provided beneath the RWD basin. Tailings material will be delivered to the site using new proposed slurry pipelines and deposition infrastructure.
- TSF barrier system will be determined in consultation with the authorities and in compliance with relevant norms and standards for determination of liner requirements in terms of the NEM:WA (GN R. 636). The waste material solutes classify as a Type 3 waste. This requires a Class C liner system. An inverted barrier system is recommended. It is a cost-effective alternative and has superior performance to a Class C barrier (Figure 5). Further design information and reports are included in Appendix J of the EIA Report (Rev. 1).
- With respect to water use, existing licenced water sources will be used and recirculated through the proposed Deelkraal II facility.

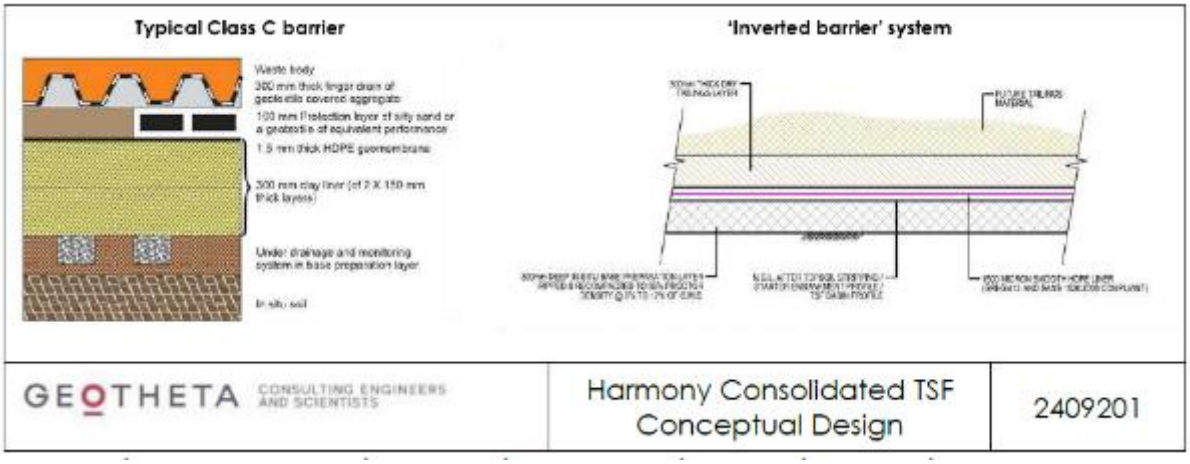


Figure 5: Comparison of typical Class C liner and inverted liner system

The construction timeline is estimated at 564 days (including timeframes for tender evaluations). This extended construction period will require further timeline and deposition access planning which will need to be confirmed with the construction contractor(s). Construction is expected to commence in 2027 if all approvals are in place. A detailed closure plan will be developed during the life of the TSF. The main objectives for the closure and rehabilitation of the TSF are to prevent pollution to the surrounding environment and ensure a stable facility is maintained.

2.1.3 RELEVANT APPROVALS

The table below lists the relevant authorisations, permits, licences and rights that are required for the proposed project.

Table 4: Required rights, permits, licences and authorisations.

Authorisation type	Competent authority	Reference	Description
Environmental Authorisation	Department of Mineral and Petroleum Resources (DMPR)	(GP) 30/5/1/1/2/07MR	Integrated application for environmental authorisation and waste management licence in terms of section 24 of NEMA and the EIA Regulations, 2014 (as amended). Listed activities triggered: GN R.983 (Listing Notice 1) Activities 10, 19 and 21D; GN R.984 (Listing Notice 2) Activities 6 and 15; GN R.985 (Listing Notice 3) Activities 4, 12 and 14. The DMPR is the competent authority for both the NEMA and the NEM:WA activities (EIA Report, Rev. 1).
Waste Management Licence	Department of Mineral and Petroleum Resources (DMPR)		Waste management licence in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) for Category B Activities B7 (disposal of hazardous waste to land), B10 (construction of a facility for a Category B waste management activity) and B11 (establishment or reclamation of a residue stockpile or residue deposit), and Category A Activity 14 (decommissioning of the existing licensed landfill on the Deelkraal II TSF site). Applied for together with the environmental authorisation; the TSF barrier system is to be determined in consultation with the authorities in terms of GN R.636.



Authorisation type	Competent authority	Reference	Description
Water Use Licence	DWS		Water use licence for the water uses associated with the TSF, return water dams, pipelines and watercourse crossings, in terms of sections 21(c), 21(i) and 21(g) of the National Water Act, 1998 (Act 36 of 1998). A separate application has been lodged with the Department of Water and Sanitation (EIA Report, Rev. 1).
Air Emissions Licence	West Rand District Municipality		Atmospheric emission licence in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004), to be lodged for the planned upgrades to the Kusasalethu plant (EIA Report, Rev. 1).
Mining Right	DMPR	(GP) 30/5/1/1/2/07MR	Existing mining right for gold held by Randfontein Estates Limited in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002). The project requires an amendment of the right and of the approved EMPr in terms of section 102 of the MPRDA (NEMA Listing Notice 1, Activity 21D).
Certificate of Registration (radiation)	National Nuclear Regulator (NNR)	CoR-58	Certificate of Registration in terms of the National Nuclear Regulator Act, 1999 (Act 47 of 1999). The project TSF falls within the scope of CoR-58 and its public Radiation Protection Programme (EMPr). Decommissioning of infrastructure that contained or is

Authorisation type	Competent authority	Reference	Description
			contaminated with radionuclides requires an NNR-approved decommissioning plan.

2.2 ENVIRONMENTAL CONTEXT

The description and definition of the environmental context is critical to ensure that the closure objectives and associated end land-use are achieved. In this regard, the description of the baseline environment (on-site and surrounding) was obtained from various studies undertaken by the specialist team and in conjunction with EIMS. All specialist studies undertaken for the proposed West Wits reclamation project are included as supporting technical appendices to the EIA report (2026). The key environmental aspects related to the project area are summarised in the remainder of this Section. Various terminology is used in this section of the report referring to the project location, which are described below:

- **Site**: Refers to the immediate site(s) / footprints and areas where the infrastructure is proposed to be located;
- **Project Area / Study Area / Region**: Refers to both the site and the general regional area and surrounds where the project is located; and
- **Project Area of Influence**: The total area / region where the project's direct and indirect impacts,both positive and negative,are likely to be felt, related to a particular project aspect or impact.

2.3 TOPOGRAPHY

The topography changes rapidly over short distances from 1600 metres above sea level (mamsl) at the top of the ridge to 1 560 mamsl at the Varkenslaagte Spruit and 1 420 mamsl in the Loopspruit. Refer to Figure 6 for a topographical map of the project area.

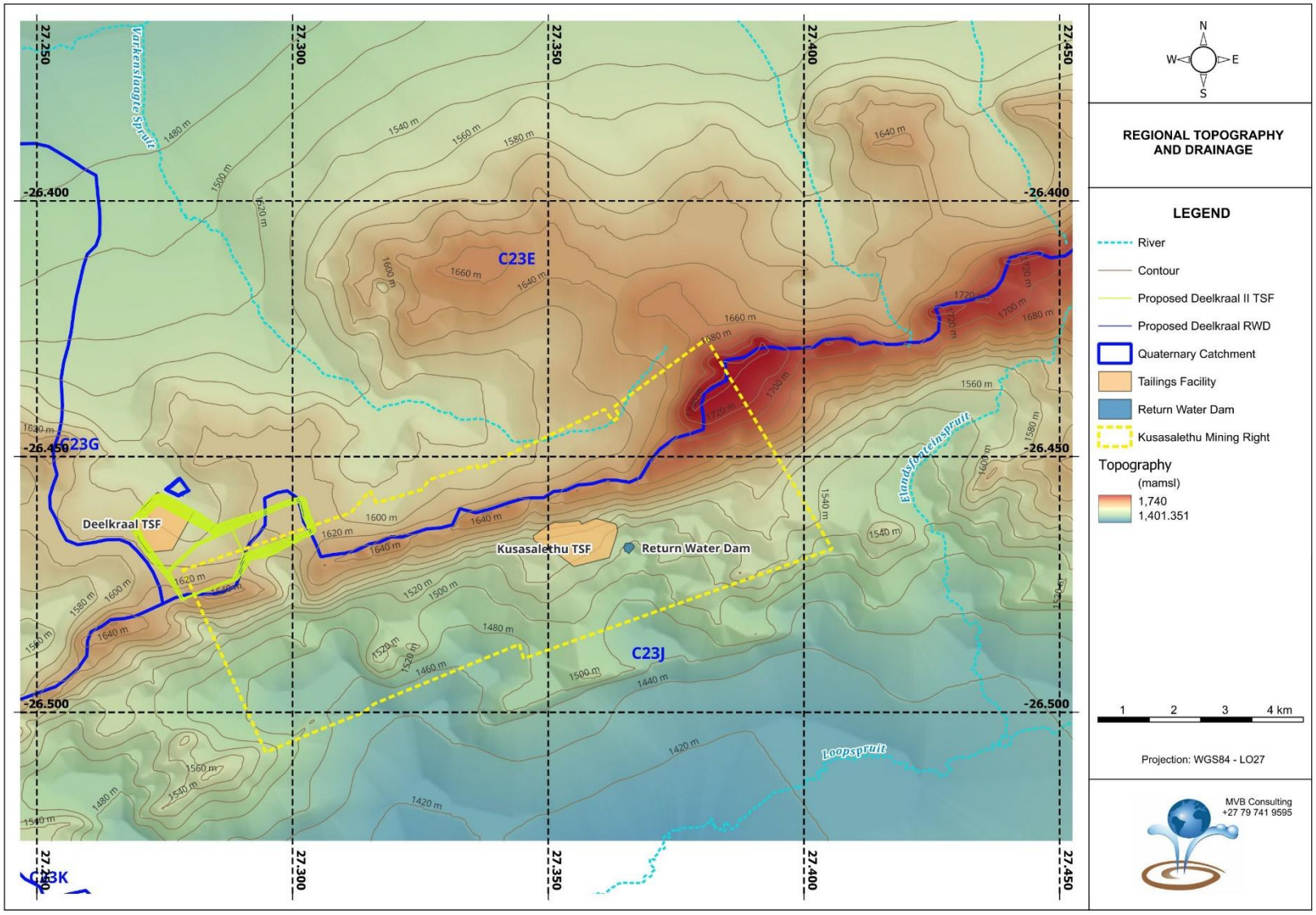


Figure 6: Topographical map of study area

2.4 GEOLOGY

The geology of the region is the controlling agent for aquifer development. The regional surface geology over the study area is presented as Figure 7 and the general stratigraphy as described as follows:

- Witwatersrand Supergroup.
- Ventersdorp Supergroup.
- Transvaal Supergroup.
- Karoo Supergroup.

2.4.1 WITWATERSRAND SUPERGROUP

The geology of the Witwatersrand Supergroup is well understood and documented as a result of extensive mining and exploratory drilling. Truswell, 1977 describes the geology in the region of the study area.

The development and preservation of the Witwatersrand basin is structurally controlled. The structural patterns control the influx of groundwater into the underground workings and as a result it is important to understand which features act as conduits and which features act as flow barriers. Dykes and sills of at least four different ages have also intruded the Witwatersrand strata. The intrusion of the dykes has often taken place along fault planes. The oldest dykes are usually diabase, representing feeder dykes to the overlying Ventersdorp lavas. There are intrusions of pyroxenite, gabbro and dolerite probably of Bushveld age. A third group belongs to the basic or alkaline dyke swarm related to the Pilanesberg alkaline complex. Finally, the youngest intrusions are of Karoo dolerite.

The Witwatersrand basin is a thick sequence of shale, quartzite and conglomerate. The average dip of the strata is 30° south. There are two main divisions, a lower predominantly argillaceous unit, known as the West Rand Group and an upper unit, composed almost entirely of quartzite and conglomerates, known as the Central Rand Group.

The West Rand Group is divided into three subgroups namely the Hospital Hill, Government Reef and Jeppestown. These rocks comprise mainly shale, but quartzite, banded ironstones, tillite and intercalated lava flows are also present. The rocks were subjected to low - grade metamorphism causing the shale to become more indurated and slaty. The original sandstone was recrystallised to quartzite.

The Central Rand Group is divided into the Johannesburg and Turffontein Subgroups and is composed largely of quartzites, within which there are numerous conglomerate zones. The conglomerate zones may contain any number of conglomerate bands, with individual bands interbedded with quartzite. The upper conglomerates are usually thicker with coarser fragments. An argillaceous zone known as the Booysens Shale (also known as the Kimberley Shale) separates the Johannesburg and Turffontein Subgroups. The economic gold deposits (reefs) are contained within the Central Rand Group.

2.4.2 VENTERSDORP SUPERGROUP

The younger Ventersdorp Supergroup overlies the Witwatersrand rocks. Although acid lavas and sedimentary intercalations occur, the Ventersdorp is composed largely of andesitic lavas and related pyroclastics. The Ventersdorp Supergroup consists of the Platberg Group and the Klipriviersberg Group. The Klipriviersberg Group consists of the Alberton and Westonaria Formations.

The Alberton Formation is composed of green – grey amygdaloidal andesitic lavas, agglomerates and tuffs. The thickness amounts to 1500m. The lack of sediments in this sequence indicates a rapid succession of lava flows, which probably came from fissure eruptions. Material of similar composition forms the oldest dykes that have intruded the Witwatersrand rocks. The abundant agglomerates provide indications of periodic explosive activity. The removal of huge volumes of volcanic material from an underlying magma chamber gave rise to tensional conditions and as a result a number of faulted structures, horst and grabens, were formed.

2.4.3 TRANSVAAL SUPERGROUP

Overlying the Ventersdorp Lavas are the Black Reef quartzite and dolomite of the Transvaal Supergroup. The Black Reef quartzite comprises coarse to gritty quartzite with occasional economically exploitable conglomerates (reefs). The entire area was peneplained in post-Ventersdorp time and it was on this surface that the Transvaal Supergroup was deposited, some 2200 million years ago. The deposition commenced with the Kromdraai Member with the Black Reef at its base. The occurrence of the gold is not as widespread as in the Witwatersrand and mainly restricted to north-south trending channels. The Black Reef is overlain by a dark, siliceous quartzite with occasional grits or small pebble bands. The quartzite grades into black carbonaceous shale. The shale then grades into the overlying dolomite through a transition zone of approximately 10m thick.

Overlying the Kromdraai Member is the dolomite of the Malmani Subgroup of the Chuniespoort Group. The dolomites are present on surface just 500m north of the Deelkraal TSF. About 1300 Ma ago the region was subjected to tension resulting in the formation of a number of large north to north-easterly striking faults. Many of the faults penetrated the full Transvaal sequence as well as the underlying Ventersdorp and Witwatersrand Supergroups. Some of the faults were filled by Pilansberg age dykes, which subdivided the dolomite into watertight groundwater compartments. The Wonderfonteinspruit tributary flows across the non-dewatered Bosbok – Turffontein dolomitic groundwater compartment. This is a sensitive aquifer that needs to be protected against impacts from the mines and other contaminant sources.

The dolomites are overlain in the south by the Pretoria Group rocks. The Rooihoogte Formation forms the basal member of the Pretoria Group, consisting of the Bevets conglomerate, shale and quartzite. The Bevets conglomerate varies in thickness between 3m and 60m (Parsons and Killick, 1985). Overlying the Bevets conglomerate is shale and sporadically developed quartzite, referred to as the Pologround quartzite. Where developed the Pologround quartzite is overlain by 150m – 200m of pink to purple shales, forming the basis of the Timeball Hill Formation. The shale is overlain by quartzite, which forms the linear north-easterly trending ridges in the south of the study area.

The Kusasalethu surface lease area is predominantly underlain by the sediments of the Pretoria Group. Figure 8 shows the near surface relationship between the Pretoria sediments and the Malmani dolomite, particularly as it relates to the localities of the Kusasalethu waste facilities (AGES, 2013).

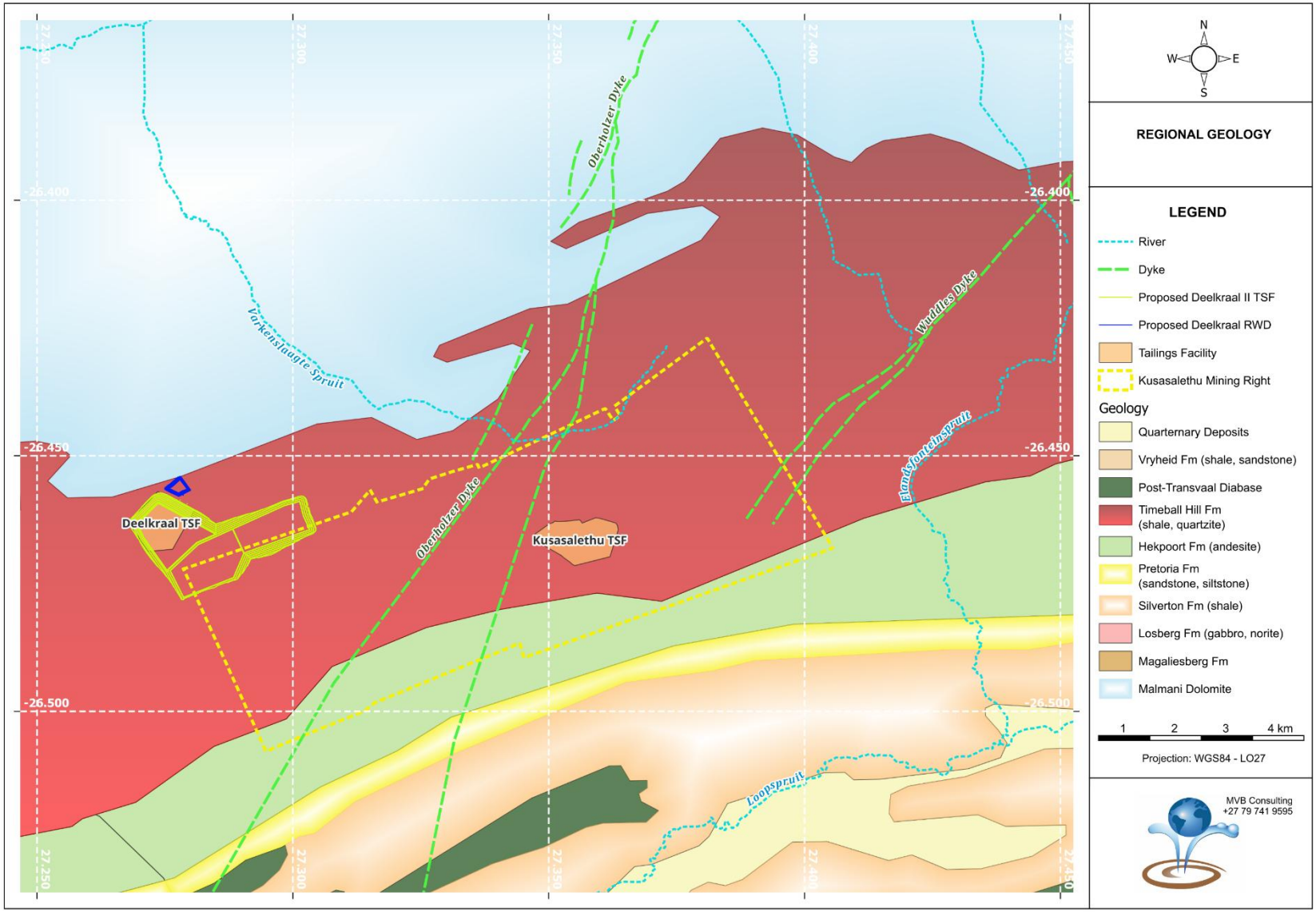


Figure 7: Regional surface geology

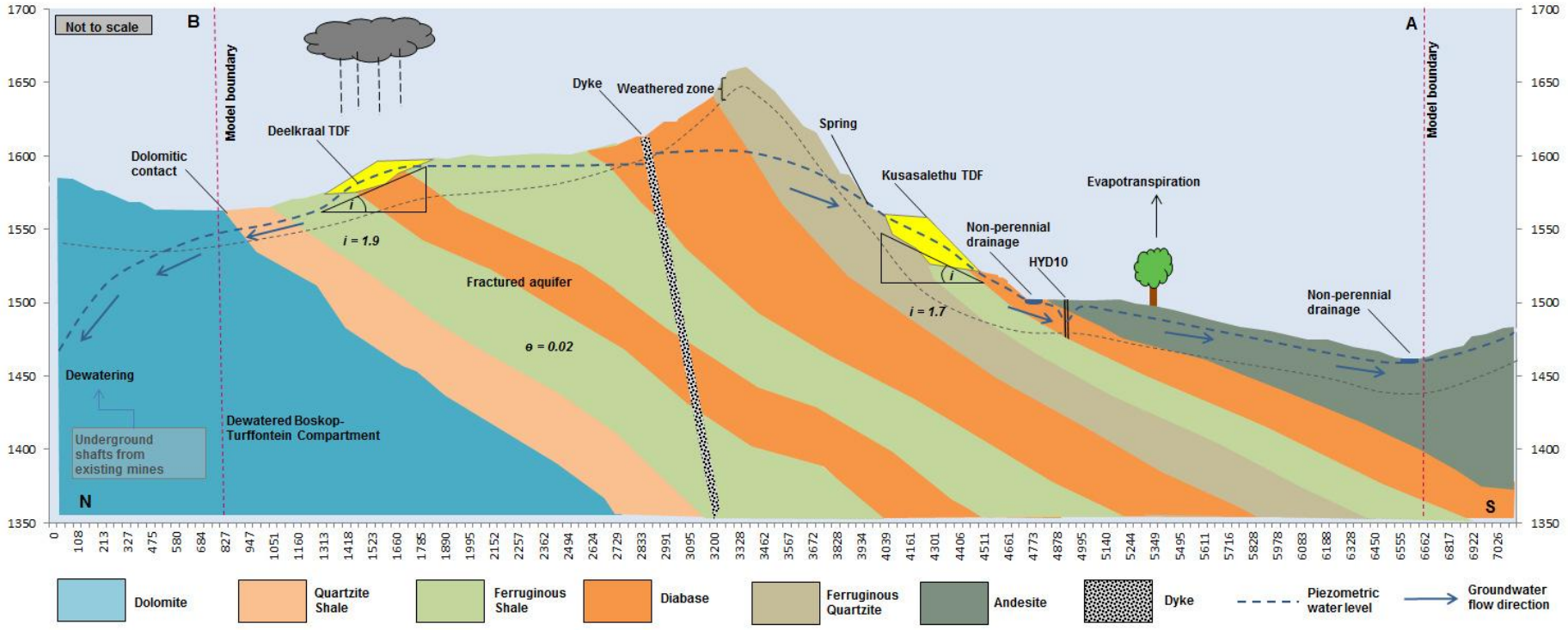


Figure 8: North-south geological section (AGES, 2013)

2.5 CLIMATE AND RAINFALL

The study area near Carletonville is classified as a Cwb climate under the Köppen-Geiger classification system (Peel, 2007), indicating a temperate climate with a Dry Winter. This classification is based on specific temperature and precipitation thresholds. The thermal regime requires the average temperature of the coldest month to exceed 0˚C, with all months averaging below 22˚C, while maintaining at least four months with an average temperature above 10˚C (Peel, 2007).

The climate is a typical Southern African Highveld climate with warm to hot summers and warm sunny winter days with frosty nights. Rainfall occurs predominantly during the summer months because of thunderstorm activity. The mean annual precipitation ranges from 565 mm to 697 mm per annum depending on the location of the weather station. Rainfall data was obtained from several sources, including mine data and data from the South African Weather Service. Climatic information relevant to the site is presented in Figure 9 - Figure 11 below.

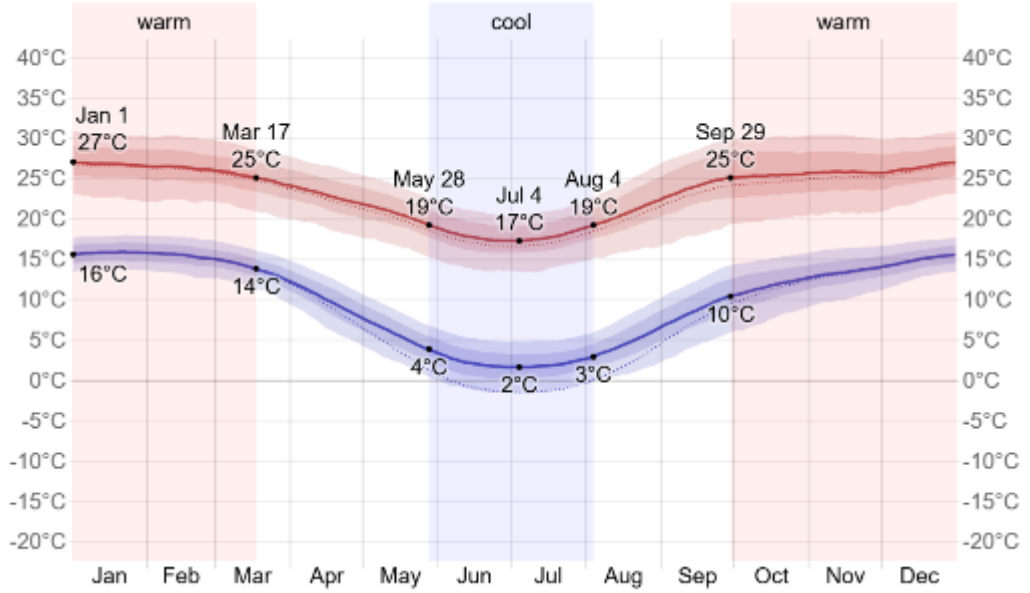


Figure 9: Average high and low temperature in Carletonville (Weather Spark, 2025).

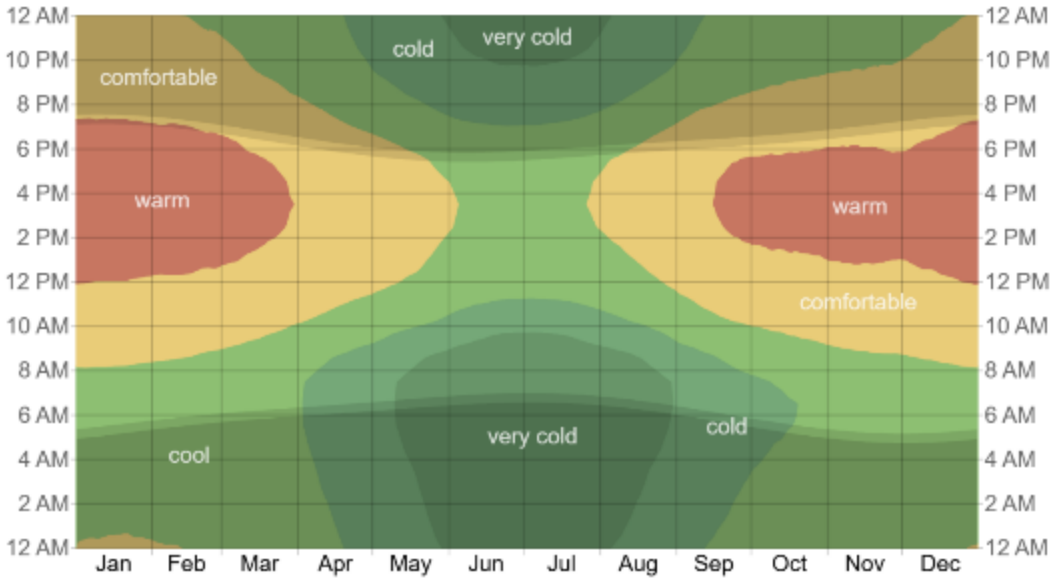


Figure 10: Average Hourly Temperature in Carletonville (Weather Spark, 2025).

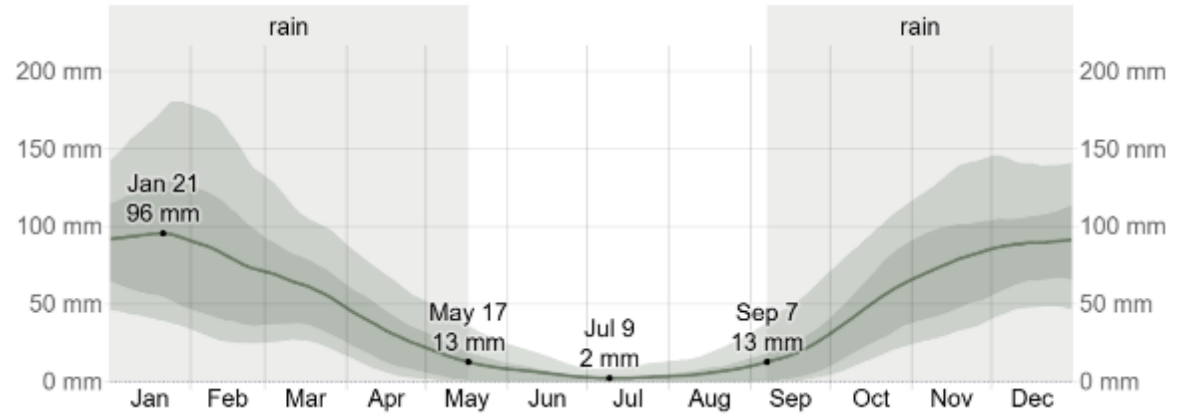


Figure 11: Average Monthly Rainfall in Carletonville (Weather Spark, 2025).

The climate in the project area, characteristic of the Southern African Highveld, exerts a dominant and dual influence on local pedogenesis (soil formation) by controlling the seasonal moisture and temperature regimes. The concentration of 565 mm to 697 mm of mean annual precipitation during the warm, hot summers is the primary driver of potential accelerated chemical weathering and deep soil profile development. The combination of high temperature and high moisture maximises the rate of mineral breakdown, particularly in the iron-rich parent material of the Timeball Hill Formation. This intense summer rainfall also facilitates severe leaching (eluviation), stripping soluble bases and fine clay particles from the upper horizons, leading to nutrient depletion and increased acidity in the topsoil over time (Weil, 2017). Information regarding predicted climate change for the area will be provided in the EIR once the climate change assessment has been completed.

2.6 CULTURAL, HERITAGE AND FOSSIL RESOURCES

Heritage and paleontological baseline information was provided by EIMS and Banzai Environmental respectively and the relevant information from those reports is presented in this section.

2.6.1 ARCHAEOLOGICAL CONTEXT

The Gauteng Province is associated with a long archaeological record that spans across pre-colonial and colonial periods. Most notable is the region's significant role in terms of the development of the mining industry of South Africa. The closest town to the site in question being Carletonville, is specifically important in this regard.

The site, as well as the associated mining operations are ~50kms south of the World Heritage Site, Cradle of Humankind. The Cradle of Humankind is globally recognised for its palaeontological value and contribution to our understandings of Human Evolution. Key fossils found in the area include examples of early hominid species such as Mrs. Ples, Little Foot, and the newly discovered fossils of Homo Naledi. While these fossils have mainly been associated with cave systems, the site's proximity to the heritage site must be acknowledged.

Like other small towns of the Far West Rand of Johannesburg, Carletonville was founded and defined by the growing mining industry of the Gauteng Province. (Van Eeden, 1998). While the town was established and further developed through the mining industry, the area was previously inhabited by groups including the Le Ghoya who were later affected by the events related to Mzilikazi's capture and domination of the area.

Following these early occupations of the region, the region became the settlement of farmers of the Zuid-Afrikaansche Republiek from as early as 1836. The area was later involved in the South African War between 1899-1902. The redevelopment of the town following the war gave rise to its establishment as a key gold mining town of the region. Apart from Carletonville, several other towns were established in the West Rand or West-Wits Line area. From between the 1930s to 1990s, Carletonville continued to develop with different groups settling in the town, stimulating its growing economy and adding new facets to Carletonville's overall cultural heritage. In the 1990s, Carletonville's gold mines contributed as much as 23% towards South Africa's overall gold production (Van Eeden, 1998).

Carletonville since became a melting pot of different cultures, with different people contributing to the continued economic development of the town and associated mining companies. Several church presences were associated with the population of Carletonville. Further, several community groups were formed, adding to the nature of cultural activities of the town as it developed.

2.6.2 POTENTIAL SITE HERITAGE FEATURES

A comprehensive assessment was conducted to evaluate potential impacts on archaeological and heritage resources. The study included a literature review, desktop assessment, and a two-day field survey.

A total of 10 distinct heritage features were identified, of which 3 may potentially be impacted by the proposed development. These included a single stone tool (WWR020), and two structures or complexes older than 60 years (WWR001 and WWR021). All other heritage features identified will not be affected by the development, however, buffers have been recommended to protect these features.

Heritage resources were identified and these features need to be avoided, specifically the netball stadium (WWR001). features. A total of 21 observations were made, of which 10 were confirmed to be of heritage significance. The following is a categorised description of the different potential heritage features identified:

- WWR012, WWR016 – Potential grave sites
- WWR001, WWR002, WWR007, WWR011, WWR014, WWR018, WWR021 – Structures, Abandoned buildings, mining, and farming infrastructure.
- WWR020 – Stone Age find
- WWR013 – Stone Wall Structure site

Figure 12 presents a visual summary of the different findings and their locations, including observations which were noted as not being of heritage significance, and or not being affected by the development. Table 4 provides a summary of the different observations made, including heritage features, a description of the feature, as well as the coordinates of where the features are located or associated relative central points. Highlighted in yellow are observations identified as heritage features which may be affected by the development.

Figure 12 presents a visual summary of the different findings and their locations. Table 5 provides a summary of the different features identified, a description of the feature, as well as the coordinates of where the feature are located or associated relative central points. Highlighted in yellow are observations identified as heritage features which may be affected by the development.

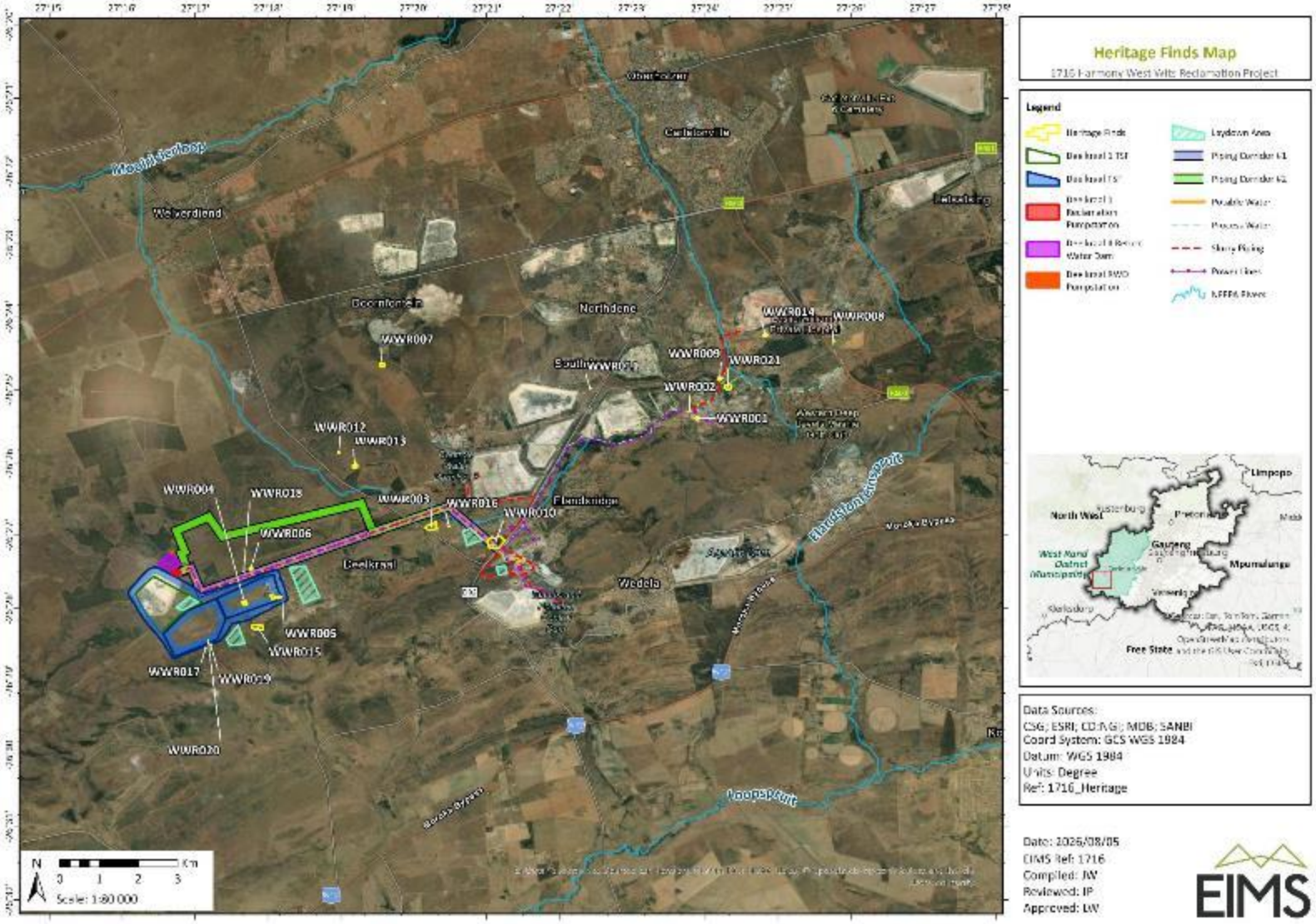


Figure 12: Heritage sites.

Table 5: Summary of different finds and sites identified.

Feature No.	Description	Rating and Significance	Coordinate
WWR001	Abandoned netball stadium – constructed in the 1950s – feature confirmed to be older than 60 years.	Grade III A High	26°25’22.75”S 27°23’54.54”E
WWR002	Foundation associated with demolished/decommissioned mining infrastructure. **No features of heritage significance.**	N/A	26°25’17.64”S 27°23’47.58”E
WWR003	Ruins of a mining village. Site has since been cleared. **Not affected by development.**	N/A	26°26’54.37”S 27°20’13.68”E
WWR004	Ruin associated with demolished/decommissioned mining infrastructure. The feature is not older than 60 years. **No features of heritage significance confirmed.**	N/A	26°27'55.36"S 27°17'39.70"E
WWR005	Ruin associated with demolished/decommissioned mining infrastructure. The feature is not older than 60 years. **No features of heritage significance confirmed.**	N/A	26°27'49.96"S 27°18'3.30"E
WWR006	Diggings or excavations associated with surrounding mining activities. **No features of heritage significance confirmed.**	N/A	26°27'27.28"S 27°17'46.00"E
WWR007	Demolished house and other structures associated with the original Doornfontein Gold Mine – Confirmed older than 60 years. **Not affected by development.**	Grade III C Medium	26°24'39.19"S 27°19'34.11"E
WWR008	Train track plinths identified through desktop assessment. Age of feature not confirmed. Verified on site to not be of heritage significance.	N/A	26°24'19.52"S 27°25'45.72"E
WWR009	Abandoned firing range. Not older than 60 years.	N/A	26°24'51.11"S 27°24'11.89"E
WWR010	Site identified through desktop assessment. Verified on site to not be of heritage significance.	N/A	26°27'6.08"S 27°21'11.86"E
WWR011	Reservoir associated with mining or farming activities – feature older than 60 years. **Not affected by development.**	Grade III C Medium	26°24'59.24"S 27°22'25.46"E
WWR012	Confirmed and previously identified grave site – including the graves of 10 or more individual. **Not affected by development.**	Grade III A High	26°25'51.48"S 27°18'58.23"E
WWR013	Previously identified SWS. **Not affected by development.**	Grade III A High	26°26'2.46"S 27°19'12.02"E
WWR014	Farm dams and other structures associated with farming activities – Structures may be older than 60 years. **Not affected by development.**	Grade III C Medium	26°24'15.42"S 27°24'49.16"E

Feature No.	Description	Rating and Significance	Coordinate
WWR015	Abandoned sports field and associated grandstand – constructed between 1977 and 1979 – feature is not older than 60 years but will carry heritage value at a later period. **Not affected by development.**	N/A	26°28'14.44"S 27°17'53.70"E
WWR016	Graveyard identified including at least 12 individual graves.	Grade III A High	26°26'52.54"S 27°20'29.20"E
WWR017	Guy stay anchor and other material evidence. **No features of heritage significance confirmed.**	N/A	26°28'32.62"S 27°17'8.69"E
WWR018	Trigonometrical Station or Beacon constructed for land surveying purposes between 1920-1930s – Older than 60 years. **Not affected by development.**	Grade III A High	26°27'29.96"S 27°17'39.94"E
WWR019	Rubble Midden including buttons and burnt materials. Potentially a dumping spot of occupants of the area. **No features of heritage significance confirmed.**	N/A	26°28'30.16"S 27°17'12.70"E
WWR020	Singular stone core including at least 4 flake removals. Find is not associated with any other surface finds.	NCW	26°28'26.37"S 27°17'10.65"E
WWR021	Abandoned Nursery complex. Some associated buildings older than 60 years.	NCW	26°24'57.35"S 27°24'19.62"E

2.6.3 PALAEONTOLOGY

The West Wits Reclamation study area, situated near Carletonville in the Gauteng Province, is mapped on the 1:250 000 West Rand 2626 (1986) geological sheet (Council for Geoscience, Pretoria). The local geology comprises sedimentary and volcanic strata of the Pretoria Group, namely the Rooihoogte, Timeball Hill (Vt), and Hekpoort Formations (Vh), which form part of the Transvaal Supergroup, as well as post-depositional diabase (di) intrusions. According to the SAHRIS Palaeosensitivity map (Figure 13 and Table 6), the Rooihoogte and Timeball Hill Formations are classified as High sensitivity (orange), the Hekpoort Formation has a Moderate sensitivity (green), and the diabase is rated as having Zero palaeontological sensitivity (grey) (Almond et al., 2013; SAHRIS website, Figure 14). In alignment with these sensitivities, the Department of Forestry, Fisheries and the Environment (DFFE) screening tool identifies the broader study area as falling within a High (red) palaeontological sensitivity zone (Figure 14).

The Rooihoogte Formation is the earliest stratigraphic unit in the study area and is part of the Pretoria Group's lowermost succession. It is predominantly composed of reddish-brown to greenish-grey shales, ferruginous mudstones, and subordinate siltstones and sandstones, which were deposited in fluvial and deltaic environments. The preservation of palaeobiological structures, particularly Microbially Induced Sedimentary Structures (MISS) and rare stromatolitic horizons, has been facilitated by the fine-grained nature of these sediments. These structures represent some of the oldest preserved evidence of life on the Kaapvaal Craton (Altermann & Nelson, 1998; Button, 1986).

The Timeball Hill Formation, which is situated above the Rooihoogte Formation, is composed of well-bedded shales, mudstones, and characteristic banded iron formations (BIFs). These formations were deposited under low-energy, prodelta to distal marine shelf conditions. The unit is known for its preservation of rare acritarchs, stromatolites, and laminated organic-rich shales, which are microscopic organic-walled microfossils that are considered among the earliest indicators of eukaryotic life (Eriksson & Catuneanu, 2004; Altermann, 2001).

The Hekpoort Formation is primarily composed of subaerial basaltic and andesitic lava flows, with infrequent volcaniclastic interbeds, and it conformably overlies the Timeball Hill Formation. This formation, which dates back to approximately 2.05 billion years ago, documents a substantial volcanic event in the Pretoria Basin. The Hekpoort Formation is primarily unfossiliferous due to its status as an igneous unit. Nevertheless, rare instances of weathered interflow sedimentary horizons may contain microbial textures or MISS, which offer substantial but limited insights into the evolution of the terrestrial biosphere during the Paleoproterozoic (Eriksson et al., 2001). This limited but scientifically pertinent potential is reflected in its Moderate palaeontological sensitivity rating.

The diabase intrusions in the study area are Jurassic in age and generally newer than the sedimentary and volcanic strata they cut. They were emplaced during later tectono-thermal events associated with Gondwana rifting. The sills and dykes formed by these medium-grained, mafic intrusive rocks are exclusively igneous in origin and, as a result, are considered palaeontologically sterile in nature. Furthermore, the placement of diabase may result in the local thermal alteration or obliteration of fossil preservation in the host rocks in the vicinity (Johnson et al., 2006).



Figure 13: Extract of the SAHRIS PalaeoMap (Council of Geosciences) indicating the High (orange), and Zero (grey) Palaeontological Sensitivity of the proposed study area.

Table 6: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	Desktop study is required

Colour	Sensitivity	Required Action
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

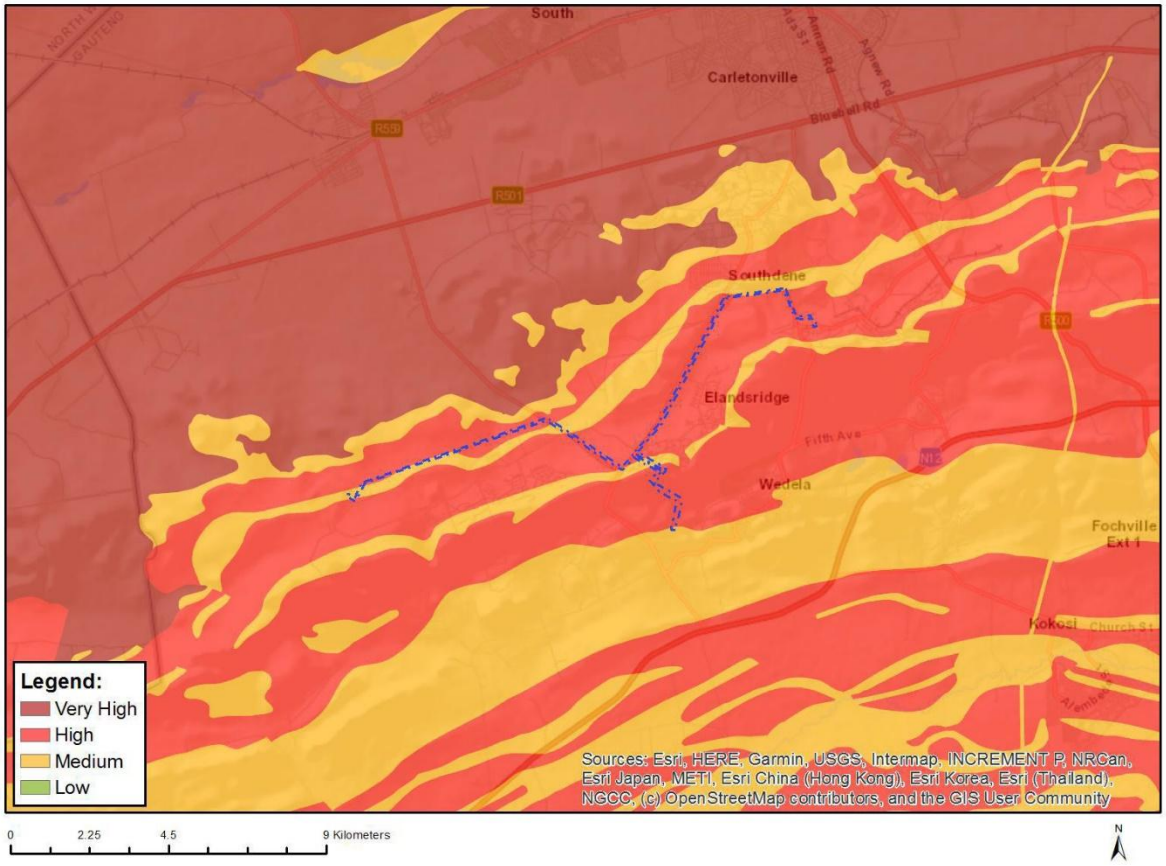


Figure 14: Palaeontological Sensitivity of the study sites in Gauteng Province by the National Environmental Web-based Screening Tool indicates a High (red) and Medium (yellow) Palaeontological Sensitivity.

The SAHRIS PalaeoMap indicates a Very High (red) Palaeontological Sensitivity for the study area, consistent with the DFFE Screening Tool (However, this elevated sensitivity rating is attributable primarily to the presence of microbially induced sedimentary structures (MISS) and stromatolitic horizons within the Rooihoogte and Timeball Hill Formations, features that are microscopic to mesoscopic in nature and are not recoverable as discrete macrofossils during a standard field-based site investigation. Similarly, the Very High sensitivity assigned to the Malmani Subgroup relates to its stromatolite assemblage, which, while scientifically significant, does not constitute visible, collectable fossil material in the conventional sense.

Given that the palaeontological sensitivity of the study area is driven by microbial structures rather than macrofossils, and that the proposed pipeline will be constructed above ground with ground disturbance limited

to localised, shallow footings, a formal palaeontological site investigation was not considered necessary. The likelihood of encountering significant, recoverable fossil material during construction is considered negligible.

2.7 SOILS

Soils and agricultural potential baseline information was provided by EIMS' soil scientist and the relevant information is presented below.

2.7.1 SOIL TYPES

The study area is predominantly characterized by land types Fb5 and Fb15. Morphologically, these units are described as shallow, rocky, and often steep environments that are moderately leached, with calcareous deposits (lime) generally restricted to valley features. In terms of pedological distribution, the Glenrosa and Mispah soil-rock complexes are the dominant formations, collectively encompassing approximately 38% of the total area. Secondary to these complexes, a cumulative 35% of the study site is comprised of the Hutton, Oakleaf, Dundee, Arcadia, and Rensburg soil series (Land Type Survey Staff, 1972 – 2006).

The area is characterized primarily by shallow soils overlying hard, fractured, or weathering rock. While calcareous deposits (lime) are generally rare or absent in upland soils, they are frequently observed in lower landscape positions. The pedological profile is dominated by soil-rock complexes, with the Mispah and Glenrosa forms being the most prevalent. Secondary to these complexes, the Hutton, Oakleaf, Dundee, Arcadia, and Rensburg series are common, while the Clovelly, Shortlands, and Avalon forms, along with streambeds, constitute less than 10% of the total surface area (Land Type Survey Staff, 1972 – 2006).



Figure 15: Land types in study area

2.7.2 AGRICULTURE POTENTIAL

A significant portion of the project area comprises mine dumps, excavations, and slimes dams; consequently, these anthropogenic features are excluded from the agricultural potential assessment. The remaining study area is dominated by Lithosols, specifically the Glenrosa and Mispah soil forms. The Glenrosa form is characterized by an orthic A-horizon overlying a lithocutanic B-horizon on hard rock, while the Mispah form consists of an orthic A-horizon directly underlain by rock. Due to effective depth limitations, the agricultural potential of these soils is classified as low. Conversely, soils identified with moderate agricultural potential include the Dundee (Du10), Avalon (Av26), and Shortlands (Sd11) forms (Land Type Survey Staff, 1972 – 2006).

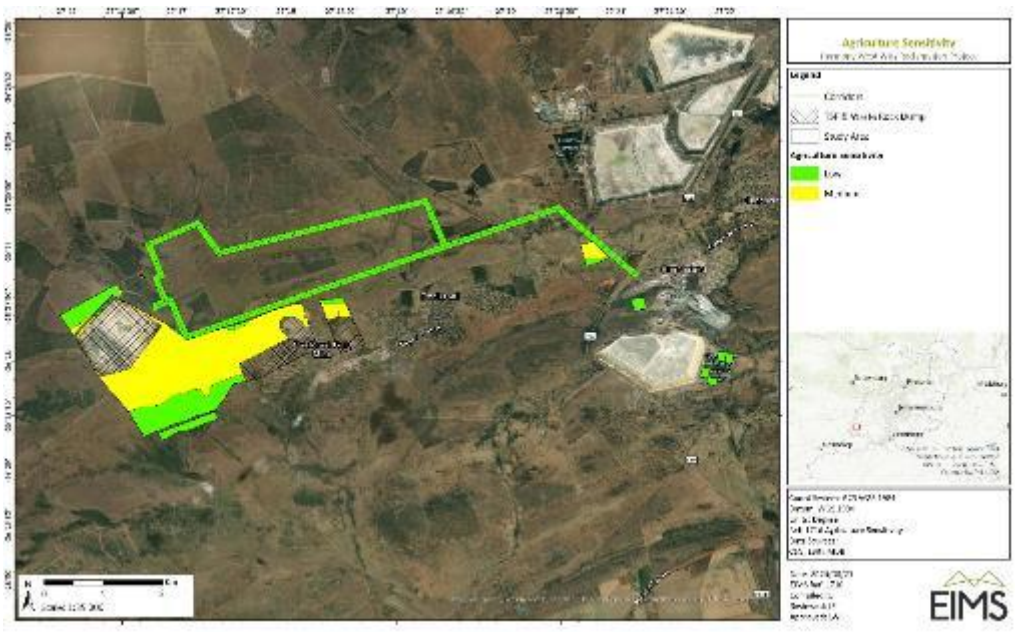


Figure 16: Agriculture Potential map of study area.

2.8 FLORA AND FAUNA

Flora and fauna baseline information was provided by the Biodiversity Company and the relevant information from those reports is presented in this section.

2.8.1 ECOLOGICALLY IMPORTANT INFORMATION AND LANDSCAPE FEATURES

2.8.1.1 **ECOSYSTEM THREAT STATUS**

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset, the Project Area of Influence (PAOI) overlaps with an LC ecosystem (Figure 17).

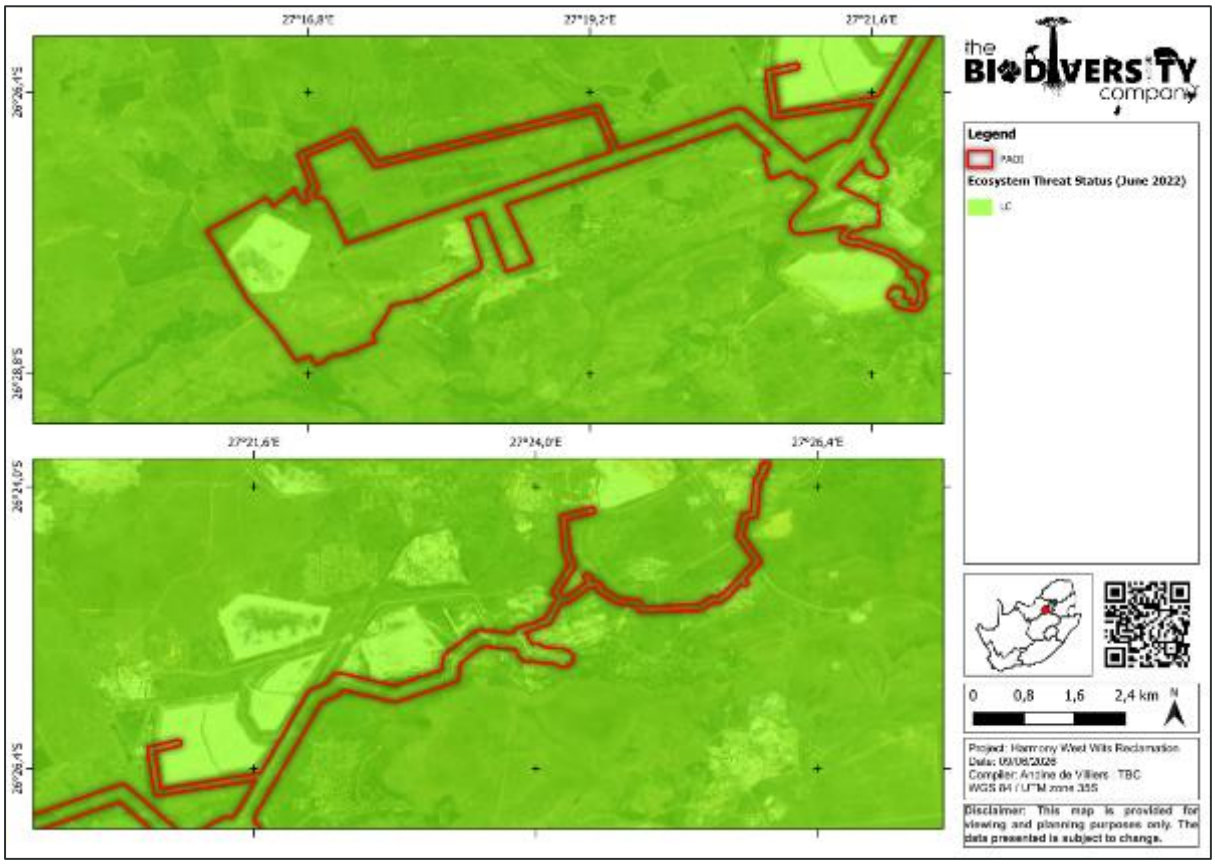


Figure 17: Map illustrating the ecosystem threat status associated with the PAOI.

2.8.1.2 **ECOSYSTEM PROTECTION LEVEL**

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with a PP ecosystem (Figure 18).

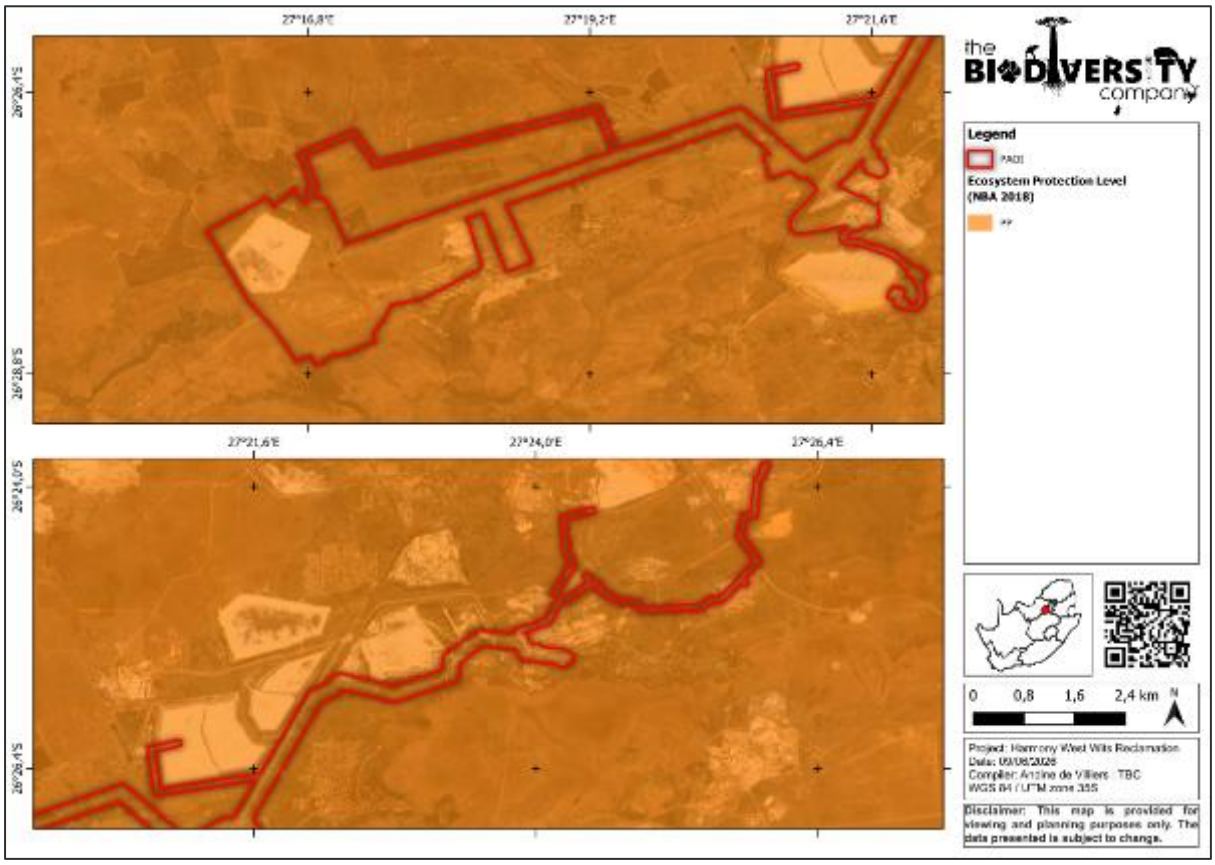


Figure 18: Map illustrating the ecosystem protection level associated with the PAOI.

2.8.1.3 CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS

The Gauteng Conservation Plan identify areas as either Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA) and Protected Areas (PA). CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an area's biodiversity characteristics, spatial configuration and requirement for meeting both biodiversity pattern and ecological process targets. CBAs include irreplaceable sites where no other options exist for meeting targets for biodiversity features (CBA 1), as well as best-design sites which represent an efficient configuration of sites to meet targets in an ecologically sustainable way that is least conflicting with other land uses and activities (CBA 2). ESAs include natural, near-natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support CBAs and/or Protected Areas. Protected Areas (PA) are areas which have legal protection under relevant legislation or which are managed with a primary conservation objective. Figure 19 shows the PAOI superimposed on the Gauteng Conservation Plan dataset. According to the Gauteng Conservation Plan dataset, the PAOI overlaps with CBA 1, ESA 1 and ESA 2 (marginally).

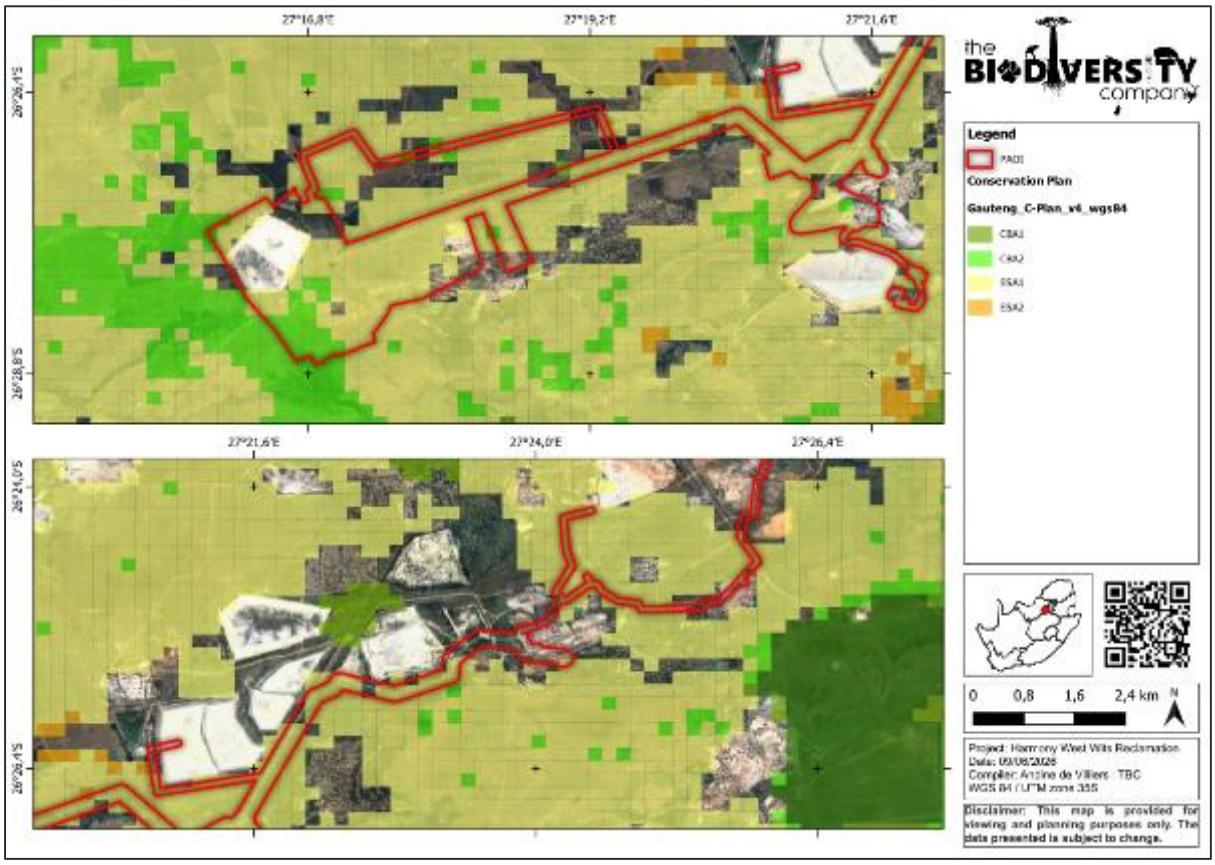


Figure 19: Map illustrating the PAOI in relation to the provincial conservation plan

2.8.1.4 **GAUTENG RIDGES**

The quartzite ridges of Gauteng are one of the most important natural assets in the northern province of South Africa. This is because these ridges, and the area immediately surrounding the ridges, provide habitat for a wide variety of fauna and flora, some of which are Red List, rare or endemic species or, in the case of certain of the plant species, are found nowhere else in South Africa or the world (GDARD, 2019). The PAOI overlaps with Class 1 Ridges and their associated 200 m buffer zones, and Class 2 Ridges (Figure 20).

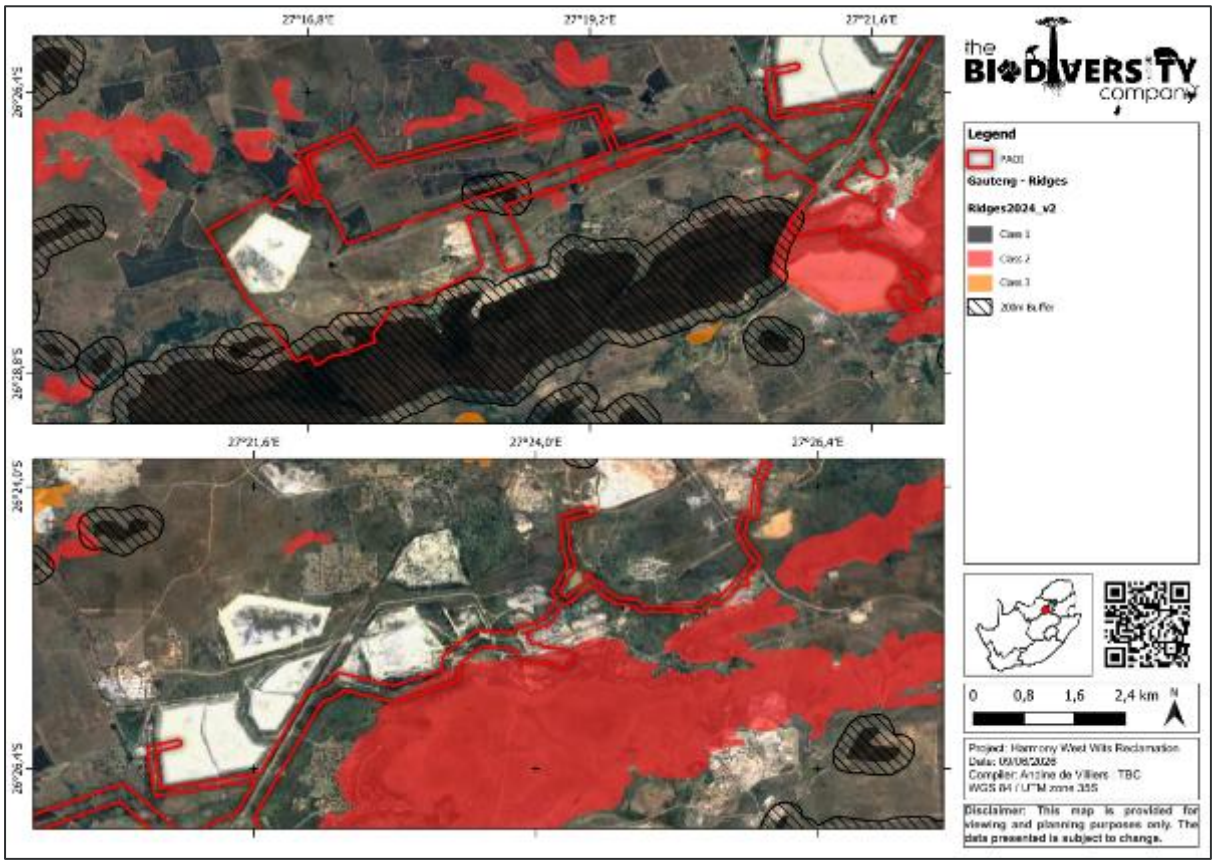


Figure 20: Map illustrating the PAOI in relation to the Gauteng Ridges

2.8.1.5 NATIONAL PROTECTED AREA EXPANSION STRATEGY

National Protected Area Expansion Strategy 2010 (NPAES) were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2010).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion, thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion strategies. These focus areas are generally large, intact and unfragmented and are, therefore, of high importance for biodiversity, climate resilience and freshwater protection (DFFE, 2022b).

The PAOI overlaps with NPAES Priority Focus Areas in the west (Figure 21).

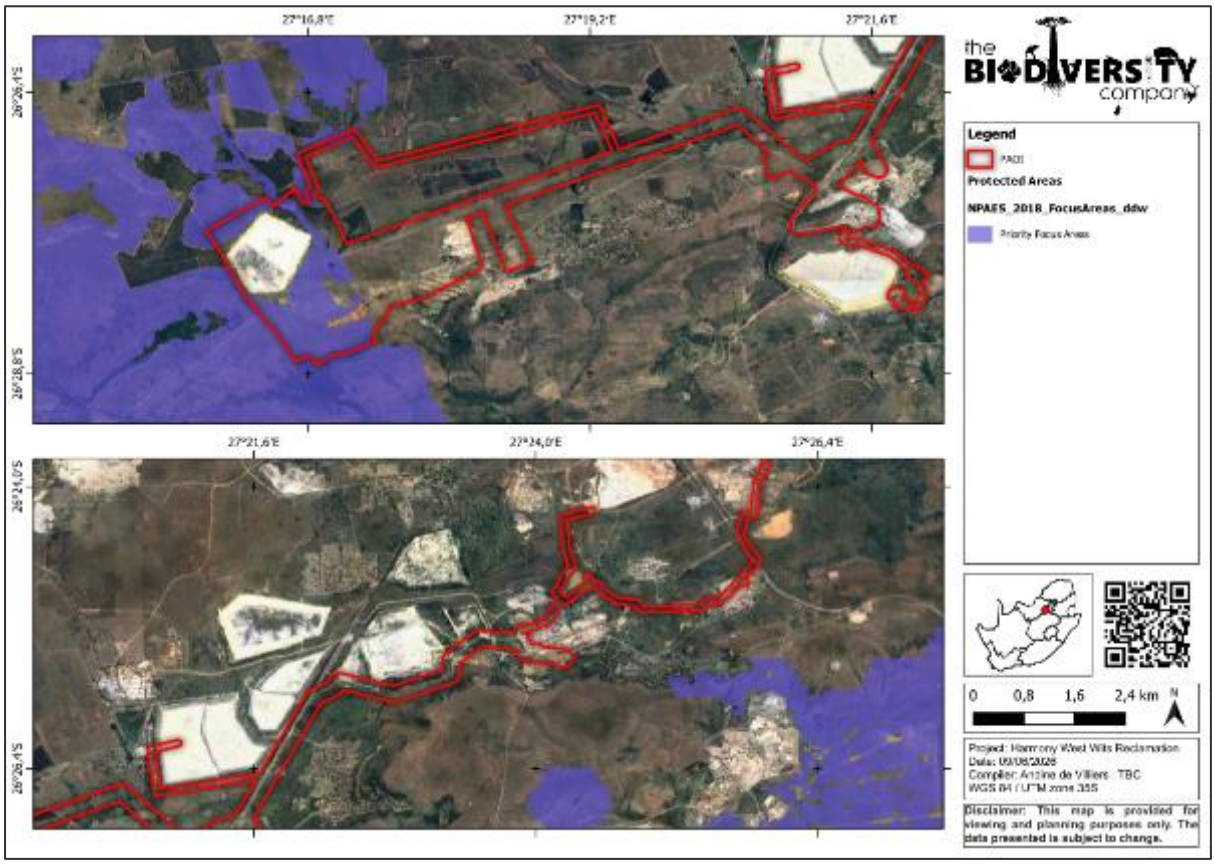


Figure 21: The PAOI in relation to the NPAES dataset

2.8.1.6 **MINING AND BIODIVERSITY GUIDELINES**

According to the Mining and Biodiversity Guidelines spatial dataset (2013) the PAOI overlaps with moderate, high and highest biodiversity importance, which correlates to a moderate, high and highest risk for mining (Figure 22).

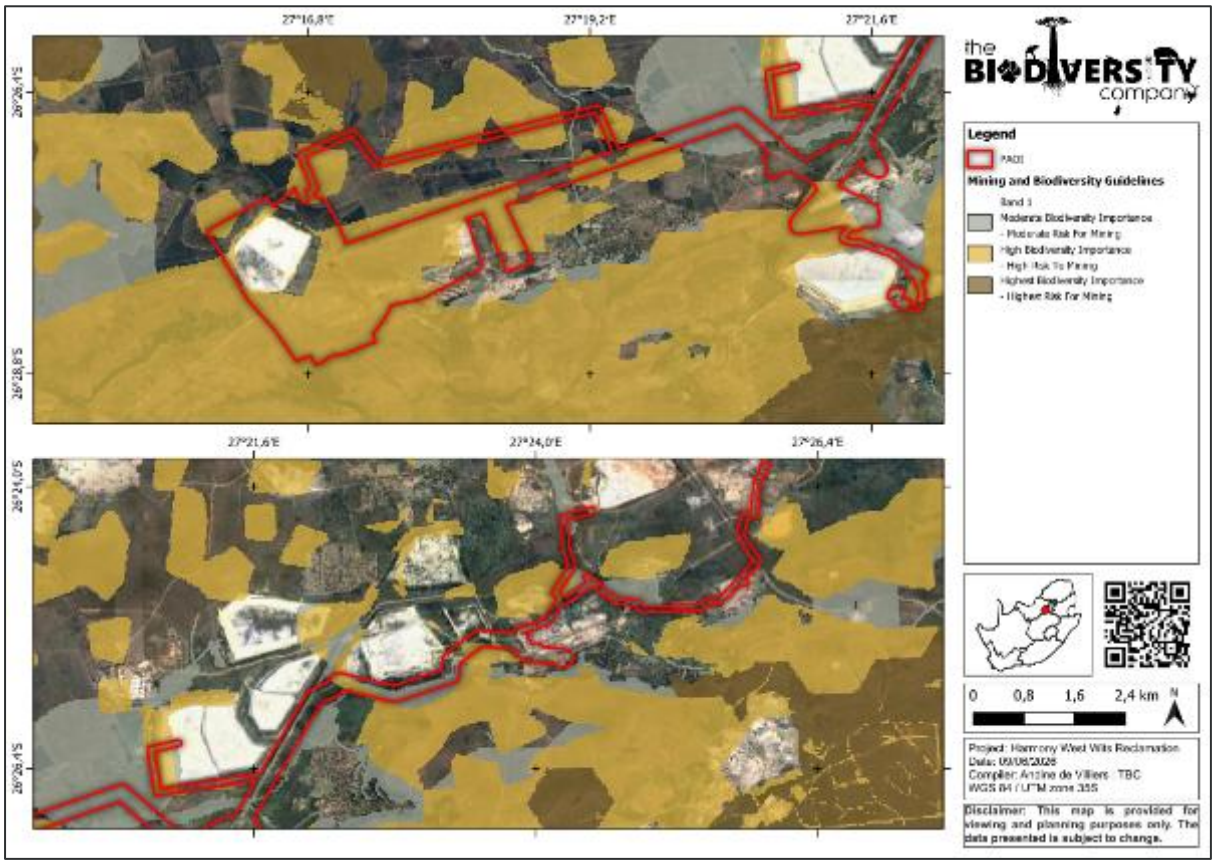


Figure 22: The PAOI in relation to the Mining Biodiversity Guidelines dataset

2.8.1.7 **HABITATS**

Habitats observed are described in Table 7 and shown in Figure 23.

Table 7: Sensitivity summary of the habitat types delineated within the PAOI

Habitat	Description and Condition	Ecosystem Processes and Services
Rocky Gauteng Shale Mountain Bushveld **91,5 ha**	This habitat is characterized by a high proportion of exposed surface rock and supports a semi-open thicket, dominated by a variety of woody species including *Senegalia afra, Searsia leptodictya, Searsia magalismontanum, Protea caffra caffra, Vachellia karoo* and *Vangueria infausta*. Other indigenous species observed within this habitat include *Macledium zeyheri, Aloe davyana, Gymnosporia buxifolia,* and *Cussonia paniculata.* No flora SCC were observed, but *Adromischus umbraticola* subsp. *umbraticola* is expected and was observed nearby. Moreover, fauna SCC, such as	This habitat provides ecological functions by offering structurally diverse habitat and refugia for multiple faunal species, while supporting pollination and seed dispersal through its flowering forbs and shrubs. The extensive rock cover allows for a suitable microclimate to be present for the survival of A. umbraticola subsp. umbraticola, providing neighboring ridge habitat with plant recruitment. This habitat provides erosion control and nutrient cycling. Carbon sequestration and

Habitat	Description and Condition	Ecosystem Processes and Services
	Crocidura maquassiensis, could occur in this habitat. This habitat is representative of the Gauteng Shale Mountain Bushveld. This habitat overlaps with CBA 2 and ESA 1, and importantly, with a Class 1 Gauteng Ridge. Current impacts are limited but include edge effects from nearby activities and small-scale illegal mining and associated ingress. Fences and historical prospecting evidence are also present. Minimal AIPs exist.	nectar resources for pollinators is also provided.
  26°26'57.31"S 27°17'0.81"E   26°28'34.04"S 27°17'9.62"E		
Degraded Gauteng Shale Mountain Bushveld **171 ha**	This habitat is comprised of areas that have undergone constant degradation, in some cases land clearance. The plant species abundance and structure has changed as a result of this degradation, leaving some areas with an increase grass and decrease in tree cover in comparison to the natural bushveld areas. Indigenous species observed within this habitat include *Vachellia karoo, Hyparrhenia hirta, Ehretia rigida* and *Senegalia afra*.	The ecosystem functioning and services provided by this habitat has been severely diminished due to anthropogenic influences. This habitat still provides areas for faunal species to forage and still acts as a movement corridor for various faunal species.

Habitat	Description and Condition	Ecosystem Processes and Services
	The floral species richness within this habitat type is diminished due to anthropogenic influences. Current impacts include AIP invasion, vehicle ingress, and edge effects from neighbouring ongoing activities. Existing infrastructure, such as pipelines and powerlines, exist here. AIP species observed within this habitat include *Tagetes minuta, Acacia melanoxylon, Lantana camara* and *Solanum mauritianum*. No floral SCC were observed within this habitat and none are expected. Fauna SCC could occur. Overlaps with ESA 1. Some areas overlap with Class 1 and Class 2 Gauteng Ridges.	
 26°27'54.54"S 27°21'59.31"E 26°24'28.48"S 27°24'14.81"E		
Irreversibly Modified **365 ha**	Irreversibly Modified habitats, in this instance, include, roads, houses, lawns/gardens, and infrastructure associated with the mining operations (TSF and processing plants). They are largely ecologically dysfunctional and have plant species that are characteristic	The ecosystem functions and services of this habitat have been severely compromised due to modification. However, it still offers some benefits, particularly by supporting the dispersal of wind-borne indigenous plant seeds, which

Habitat	Description and Condition	Ecosystem Processes and Services
	of disturbance. Moreover, multiple AIPs occur within this habitat. No SCC were observed and none are expected.	aids in plant recruitment in surrounding areas.
 26°25'22.36"S 27°24'0.67"E  26°27'24.28"S 27°21'28.83"E  26°24'6.54"S 27°25'52.49"E  26°27'45.79"S 27°18'7.86"E		
Severely Modified: Alien Stand **120 ha**	Severely Modified habitats, in this instance, consist of dense AIP stands, especially characterised by *Eucalyptus camaldulensis* stands in the western section of the PAOI, and mixed-species infestations in the eastern section. No SCC were observed. No flora SCC are expected. Fauna SCC (especially avifauna) could forage in the habitat.	The ecosystem functions have been greatly reduced from natural conditions; however, the vegetation that remains in this habitat may provide foraging, movement, and refuge opportunity to fauna species, as well as aiding in ground stabilisation and erosion prevention.

Habitat	Description and Condition	Ecosystem Processes and Services
  26°27'13.31"S 27°16'40.79"E   26°25'25.52"S 27°23'19.59"E		
Degraded Carletonville Dolomite Grassland **248,9 ha**	This habitat is representative of Carletonville Dolomite Grassland, but in a degraded state. Overgrazing and mismanagement have led to the grass layer being reduced to short tufts with sparse vegetation in between. *Seriphium vulgaris* has invaded these areas due to overgrazing. Indigenous species observed within this habitat include *Helichrysum nudifolium, Hyparrhenia hirta, Felicia muricata,* and *Helichrysum setosum.* The floral species richness within this habitat type is diminished due to anthropogenic influences. Current impacts include overgrazing, vehicle ingress and edge effects from the surrounding anthropogenic activities. This habitat is no longer representative of the Carletonville Dolomite Grassland vegetation type. However, it must be noted that this habitat overlaps with CBA 2 and ESA 1 according to the provincial conservation plan.	The ecosystem functioning and services of this habitat has been hindered due to the anthropogenic disturbances. This disturbed habitat still however provides important ecosystem services, including soil stabilisation through remaining grass and shrub cover, which helps reduce wind and water erosion. The habitat offers movement corridors for a variety of fauna.

Habitat	Description and Condition	Ecosystem Processes and Services
	No floral SCC were observed within this habitat, and none are expected. Fauna SCC could occur within the area.	
 26°27'31.05"S 27°17'46.65"E  26°27'55.18"S 27°16'48.66"E		
Carletonville Dolomite Grassland **103 ha**	Even though the vegetation map has classed the whole PAOI as Gauteng Shale Mountain Bushveld, certain portions of the PAOI were identified as Carletonville Dolomite Grassland based on plant species characteristic of that vegetation type and landscape features. The vegetation type consists of undulating plains with chert ridges (rocky outcrops), with a species-rich composition. In this habitat, rocky features are absent. Dominant species observed include *Aristida congesta, Cynodon dactylon, Eragrostis racemosa, Heteropogon contortus,* and *Sporobolus pectinatus.* Moreover, *Helichrysum chionosphaerum, Parinari capensis,* and *Hypoxis hemerocallidea* were observed. Current impacts to this habitat type include grazing, roads, vehicle ingress and other existing linear infrastructure (powerlines and pipelines). The main determining factor between the Rocky Carletonville Dolomite Grassland	This habitat supports primary production, soil stabilization, nutrient cycling, and water regulation, enhanced by its substantial vegetation cover. This habitat provides ecological functions by offering structurally diverse habitat and refugia for multiple faunal species, while supporting pollination and seed dispersal through its flowering forbs and shrubs. The mix of grasses and shrubs provides forage, and plant clumps offer shade and shelter, helping small mammals, reptiles, and ground-dwelling birds survive.

Habitat	Description and Condition	Ecosystem Processes and Services
	and the Carletonville Dolomite Grassland is the presence of rocky outcrops. Moreover, the Degraded Carletonville Dolomite Grassland differs in the level of grazing pressure and historical (2013) disturbance. No flora SCC were observed and none are expected. No fauna SCC were observed, but some could use the area for foraging and movement. This habitat overlaps with CBA 2 and ESA 1.	
 		
Rocky Carletonville Dolomite Grassland **21,9 ha**	Even though the vegetation map has classed the whole PAOI as Gauteng Shale Mountain Bushveld, certain portions of the PAOI were identified as Carletonville Dolomite Grassland based on plant species characteristic of that vegetation type and landscape features. The vegetation type consists of undulating plains with chert ridges (rocky outcrops), with a species-rich composition. In this habitat, rocky features are present. Dominant species observed include *Aristida congesta, Cynodon dactylon, Eragrostis racemosa, Heteropogon contortus,* and *Sporobolus pectinatus.* Moreover, *Helichrysum chionosphaerum, Parinari capensis,* and *Hypoxis hemerocallidea* were observed. Current impacts to this habitat type include grazing, roads, vehicle ingress and other existing linear infrastructure (powerlines and pipelines). The main determining factor between the Rocky Carletonville Dolomite Grassland and the Carletonville Dolomite Grassland	This habitat supports primary production, soil stabilization, nutrient cycling, and water regulation, enhanced by its substantial vegetation cover. This habitat provides ecological functions by offering structurally diverse habitat and refugia for multiple faunal species, while supporting pollination and seed dispersal through its flowering forbs and shrubs. The mix of grasses and shrubs provides forage, and plant clumps offer shade and shelter, helping small mammals, reptiles, and ground-dwelling birds survive. The potential presence of SCC and protected plant species further underscores this habitat's importance in

Habitat	Description and Condition	Ecosystem Processes and Services
	is the presence of rocky outcrops. Moreover, the Degraded Carletonville Dolomite Grassland differs in the level of grazing pressure and historical (2013) disturbance. No flora SCC were observed, however, three are expected (based on desktop data, suitable habitat, and confirmed nearby occurrence), namely *Khadia beswickii, Cleome conrathii* and *Adromischus umbraticola* subsp. *umbraticola*). No fauna SCC were observed, but some could use the area for foraging and movement. This habitat overlaps with ESA 1.	maintaining ecosystem functioning. It also facilitates the recruitment and dispersal of SCC into surrounding areas, supporting the persistence of these species and strengthening their population numbers.
 26°27'27.74"S 27°16'19.14"E		
Freshwater Features: (Split into) **Wetlands and in-stream dams** **(101,3 ha)** **and** **Artificial, off-stream dams, rock quarry, and non-perennial drainage** **(110,3 ha)**	This habitat type consists of wet portions of land as delineated by the aquatic specialists. Additional information regarding this habitat unit may be found in the accompanying Aquatics Report (TBC, 2026). These features consist of wetlands, in-stream dams, off-stream dams, a rocky quarry, non-perennial drainage features, and artificial features. The wetlands and in-stream dams are predominantly more natural, and as such, provides potential foraging habitat (and free water) for indigenous fauna and potential SCC. The off-stream dams, rock quarry, non-perennial drainage features and artificial features provide limited potential habitat.	This habitat provides water to faunal species and aids in water purification, flood regulation, groundwater recharge, and erosion control.

Habitat	Description and Condition	Ecosystem Processes and Services



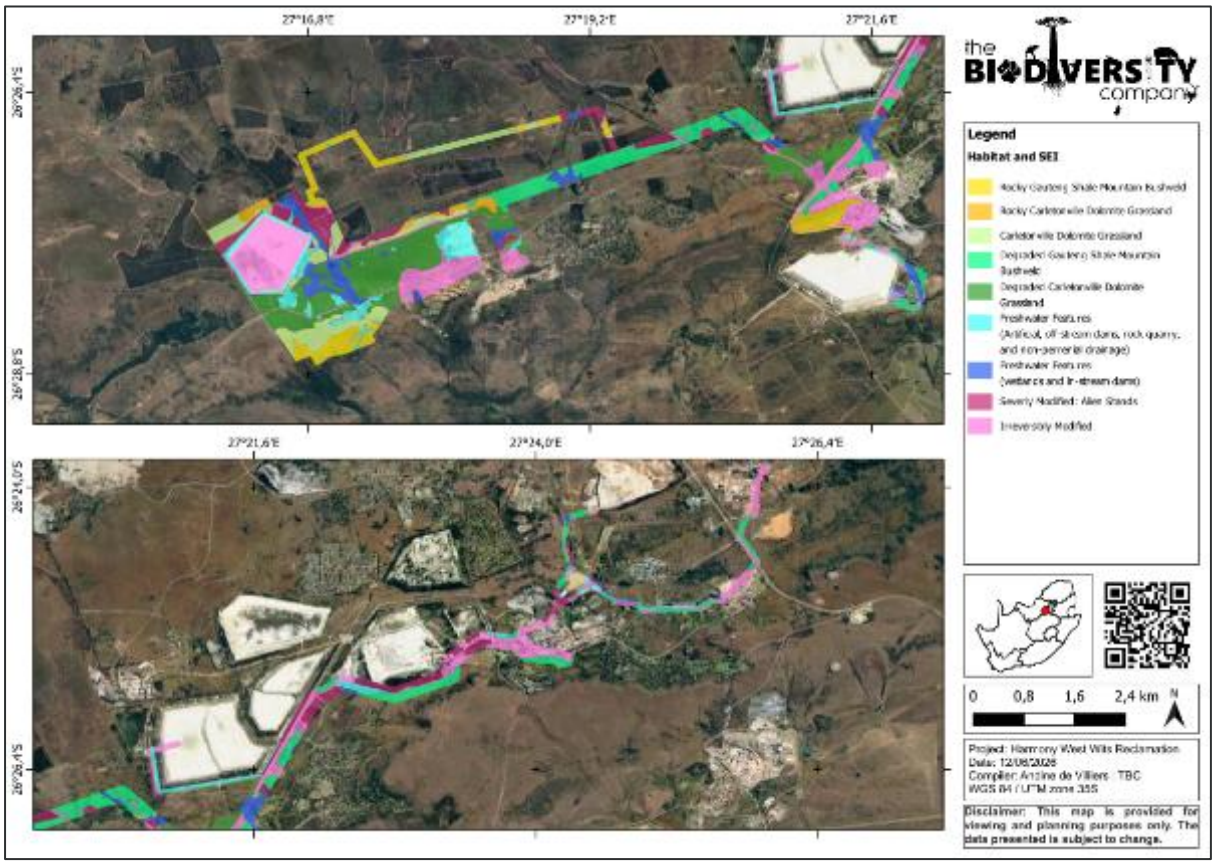


Figure 23: Identified habitats

2.8.2 FLORA

The PAOI is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include Acacia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

The PAOI largely overlaps with the Gauteng Shale Mountain Bushveld vegetation type. There is a marginal overlap with the Andesite Mountain Bushveld vegetation type in the west of the PAOI (Figure 24). It must be noted that although the PAOI is situated in the savanna biome, it is located near the grassland biome, specifically, the Carletonville Dolomite Vegetation Type (to the north).

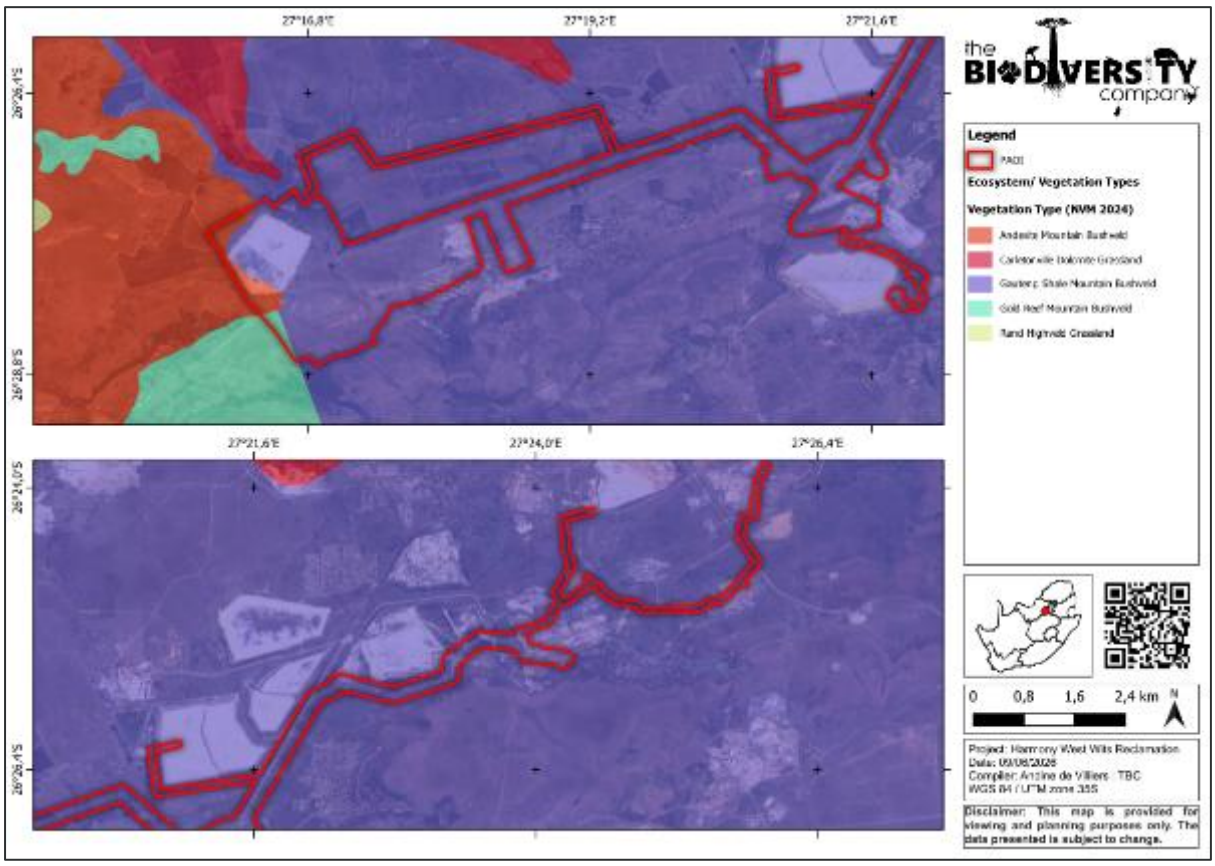


Figure 24: Map illustrating the vegetation types associated with the PAOI.



2.8.2.1 GAUTENG SHALE MOUNTAIN BUSHVELD

This vegetation unit occurs mainly on the ridge of the Gatsrand south of Carletonville-Westonaria-Lenasia. It also occurs as a narrow band along the ridge that runs form a point between Tarlton and Magaliesberg in the west, through Sterkfontein, Pelindaba, Atteridgeville to Klapperkop and southeastern Pretoria in the east. The altitude ranges between 1300 to 1 750 m. It consists of low, broken ridges varying in steepness and with high surface rock cover. Vegetation is a short, semi-open thicket dominated by a variety of woody species. The understorey is dominated by a variety of grasses. Some of the ridges form plateaus above the northern slopes that carry scrubby grassland with high surface rock cover.

Important Taxa (d = dominant)

Small Trees: *Senegalia affra* (d), *Dombeya rotundifolia* (d), *Vachellia karroo, Celtis africana, Combretum molle, Cussonia spicata, Englerophytum magalismontanum, Protea affra, Searsia leptodictya, Vangueria infausta, Zanthoxylum capense, Ziziphus mucronata.*

Tall Shrubs: *Asparagus laricinus, Canthium gilfillanii, Chrysanthemoides monilifera, Dichrostachys cinerea, Diospyros austro-africana, D. lycioides* subsp. *lycioides, Ehretia rigida* subsp. *rigida, Euclea crispa* subsp. *crispa, Grewia occidentalis, Gymnosporia polyacantha, Olea europaea* subsp. *africana, Tephrosia capensis, T. longipes*.

Low Shrubs: *Acalypha angustata, Asparagus suaveolens, Athrixia elata, Felicia muricata, Indigofera comosa, Rhus magalismontana subsp. magalismontana.*

Geoxylic Suffrutex: *Elephantorrhiza elephantina.*

Succulent Shrub: *Kalanchoe rotundifolia.*

Woody Climber: *Ancylobotrys capensis.*

Graminoids: *Hyparrhenia dregeana* (d), *Cymbopogon caesius, C. pospischilii, Digitaria eriantha subsp. eriantha, Eragrostis curvula.*

Herbs: *Dicoma zeyheri, Helichrysum nudifolium, H. rugulosum, Hermannia lancifolia, Hibiscus pusillus, Selaginella dregei, Senecio venosus, Vernonia natalensis, V. oligocephala.*

Geophytic Herbs: *Cheilanthes hirta, Pellaea calomelanos, Scadoxus puniceus.*

Conservation Status: This vegetation type is classified as Least Concern (RLE, 2022) The national target for conservation protection for this vegetation type is 24%. Less than 1% is statutorily conserved, for example, the Skanskop and Hartbeesthoek Nature Reserves, Magaliesberg Nature Area and Groenkloof National Park. Additionally, over 1% conserved in other reserves including the John Nash Nature Reserve, Cheetah Park and Hartbeesthoek Radio Astronomy Observatory. About 21% transformed mainly by urban and built-up areas, mines and quarries, cultivation and plantations. Wattles a common invasive plant in places.

2.8.2.2 ANDESITE MOUNTAIN BUSHVELD

The Andesite Mountain Bushveld vegetation type occurs in several separate patches across Gauteng, North-west, Mpumalanga and the Free State Provinces (Mucina & Rutherford, 2006). Several separate occurrences of which the main are: the Bronberg Ridge in eastern Pretoria extending to Welbekend; from Hartebeesthoek in the west along the valley between the two parallel ranges of hills to Atteridgeville; hills in southern Johannesburg; several hills encompassing Nigel, Willemsdal, Coalbrook and Suikerbosrand (in part); and the outer ring of ridges of the Vredefort Dome and some hills to the northwest around Potchefstroom. This vegetation type occurs at an altitude of about 1 350–1 800m. This vegetation type is characterized by dense, medium-tall thorny bushveld with a well-developed grass layer on hill slopes and some valleys with undulating landscape.

Important Plant Taxa (d = dominant)



Small Trees: *Senegalia affra* (d), *Vachellia karroo* (d), *Celtis africana*, *Protea affra*, *Zanthoxylum capense*, *Ziziphus mucronata*.

Tall Shrubs: *Asparagus laricinus* (d), *Euclea crispa* subsp. *crispa* (d), *Rhus pyroides* var. *pyroides* (d), *Diospyros lycioides* subsp. *lycioides*, *Gymnosporia polyacantha*, *Lippia javanica*, *Rhamnus prinoides*.

Low Shrubs: *Asparagus suaveolens* (d), *Rhus rigida* var. *margaretae*, *Teucrium trifidum*.

Soft Shrub: *Isoglossa grantii*.

Woody Climber: *Rhoicissus tridentata*.

Graminoids: *Eragrostis curvula* (d), *Hyparrhenia hirta* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Cymbopogon pospischilii*, *Digitaria eriantha* subsp. *eriantha*, *Elionurus muticus*, *Eragrostis racemosa*, *E. superba*, *Panicum maximum*.

Succulent Herb*: Aloe greatheadii* var. *davyana*; and

Herbs: *Commelina africana*, *Vernonia galpinii*, *V. oligocephala*.

Conservation Status of the Vegetation Type : This vegetation type is classified as Least Concern (RLE, 2022). The national target for conservation protection is 24%. About 7% are statutorily conserved mainly in the Suikerbosrand Nature Reserve and Magaliesberg Nature Area. An additional 1–2% conserved in other reserves mainly in the Hartbeesthoek Radio Astronomy Observatory. Some 15% have already transformed, mainly by cultivation and some urban and built-up areas.

2.8.2.3 GOLD REEF MOUNTAIN BUSHVELD

Gold Reef Mountain Bushveld vegetation type is found in the North-West, Gauteng, Free State and Mpumalanga Provinces. This vegetation type typically comprises of Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of *Senegalia caffra* on the southern slopes). Tree cover elsewhere is variable while the tree and shrub layers are often continuous.

Important Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the Soweto Highveld Grassland.

Small Trees: *Senegalia caffra* (d), *Combretum molle* (d), *Protea caffra* (d), *Celtis africana*, *Dombeya rotundifolia*, *Englerophytum magalismontanum*, *Ochna pretoriensis*, *Searsia leptodictya*, *Vangueria infausta*, *V. parvifolia*, *Ziziphus mucronata*.

Tall Shrubs: *Canthium gilfillanii*, *Ehretia rigida* subsp. *rigida*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Mystroxylon aethiopicum* subsp. *burkeanum*.

Low Shrubs: *Athrixia elata*, *Pearsonia cajanifolia*, *Rhus magalismontana* subsp. *magalismontana*, *R. rigida* var. *rigida*.

Woody Climber: *Ancylobotrys capensis*.

Graminoids: *Loudetia simplex* (d), *Panicum natalense* (d), *Schizachyrium sanguineum* (d), *Trachypogon spicatus* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Bewsia biflora*, *Digitaria tricholaenoides*, *Diheteropogon amplectens*, *Sporobolus pectinatus*, *Tristachya biseriata*, *T. leucothrix*.

Herbs: *Helichrysum nudifolium*, *H. rugulosum*, *Pentanisia angustifolia*, *Senecio venosus*, *Xerophyta retinervis*.

Geophytic Herbs: *Cheilanthes hirta*, *Hypoxis hemerocallidea*, *Pellaea calomelanos*.

Endemic Taxa

Succulent Shrub: *Aloe peglerae.*

Succulent Herb: *Frithia pulchra*.

Conservation Status: According to the Red List of Ecosystems (June 2022), this vegetation type is classified as Least Concern. The national target for conservation protection for both these vegetation types is 24%, with 22% statutorily conserved mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenberg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% of this vegetation type is conserved in other reserves which brings the total area conserved very close to target. About 15% has been transformed mainly by cultivation and urban and built-up areas and some areas with dense stands of the alien *Melia azedarach* are embedded within this unit.

2.8.2.4 FLORA DESCRIPTION

The GBIF (Global Biodiversity Information Facility - www.gbif.org) database indicates that 356 species of plants are expected to occur within the PAOI and surrounding area. The full list of species will be provided in the final report. The GBIF database lists four (4) sensitive species that could occur within the PAOI. The DFFE screening tool lists two (2) sensitive species which could occur within the PAOI (five in total) (Table 8).

Please note that the Screening Tool report includes lists of bird, mammal, reptile, amphibian, butterfly, and plant species of conservation concern known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. Such species have had their names obscured and are listed as sensitive plant unique number / sensitive animal unique number. As per the best practise guideline that accompanies the protocol and screening tool, please, the name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. It should be referred to as sensitive plant or sensitive animal and its threat status may be included, e.g. critically endangered sensitive plant or endangered sensitive animal.

Table 8: Threatened flora species that are expected to occur within the PAOI; VU = Vulnerable; LC = Least Concern; CR = Critically Endangered; EN = Endangered; NE = Not Evaluated.

Family Name	Scientific Name	Regional (SANBI)	Global (IUCN)	Screening Tool Sensitivity	Habitat	Likelihood of Occurrence	Reason
Aizoaceae	*Khadia beswickii*	VU	CR	Medium	Open shallow soil over rocks in grassland.	Medium	Suitable habitat in PAOI
Aizoaceae	*Delosperma purpureum*	EN	Not listed		South-facing slopes, in shallow soils among crystalline or conglomerate quartzitic rocks, in sun or in partial shade, rarely in shade, in grassland with some trees	Medium	Suitable habitat in PAOI
Crassulaceae	*Adromischus umbraticola*	NT	NE	Plants grow on south-facing rock crevices on ridges	-	High	Suitable habitat, confirmed nearby

2.8.3 FAUNA

This section of the report describes the fauna species that are expected to occur on site.

2.8.3.1 AMPHIBIANS AND REPTILES

Based on the GBIF database, two (2) amphibian and twenty (20) reptile species are expected to occur within the area, none of which are classified as SCC (Full list in Appendix C). No species are listed by the DFFE Screening Tool. No reptile or amphibian species were recorded for the PAOI. This is attributed to the secretive nature of these species and common reptile and amphibian species are expected.

2.8.3.2 INSECTS AND INVERTEBRATES

The DFFE screening tool lists 2 insect SCCs and 1 invertebrate SCC for the PAOI (Table 9).

Table 9: Threatened insect and invertebrate species that are expected to occur within the PAOI NT = Near threatened; VU = Vulnerable; LC = Least Concern.

Family Name	Scientific Name	Common Name	Regional (SANBI)	Global (IUCN)	Screening Tool Sensitivity	Habitat	Likelihood of Occurrence	Reason
Insect								
Lycaenidae	*Lepidochrysops praeterita*	Highveld Blue	EN	EN	Medium	Confined to grassy, rocky, typically south-facing slopes, where its host plant (*Ocimum obovatum*) and, presumably, its host ant occur.	Medium	Known to inhabit areas with dense human habitation and intensive land use. Suitable habitat in project area
Lycaenidae	*Lepidochrysops procera*	Grassveld Nimble Blue	Rare	LC	Medium	Rocky areas in grassland (and grassy areas in savanna), where its larval host plant, *Ocimum obovatum*, occurs.	Medium	Suitable habitat in project area
Invertebrate								
Tettigoniidae	*Clonia uvarovi*	Uvarov's Clonia	VU	VU	Medium	Woodland savannah.	Medium	Suitable habitat in project area

2.8.3.3 MAMMALS

Based on the GBIF (www.gbif.org) database, 12 mammal species could be expected to occur within the area of which 3 are an SCC (Table 10).

Table 10: Threatened mammal species that are expected to occur within the PAOI; NT = Near threatened; VU = Vulnerable; LC = Least Concern.

Family Name	Scientific Name	Common Name	Regional (SANBI)	Global (IUCN)	Screening Tool Sensitivity	Habitat	Likelihood of Occurrence	Reason
Giraffidae	*Giraffa camelopardalis*	Giraffe	-	LC	VU	Savanna/woodland habitats, but range widely	Low	Restricted to game reserves
Soricidae	*Crocidura maquassiensis*	Makwassie Musk Shrew	VU	LC	Medium	Found in rocky, mountain and grassland habitat.	Medium	May tolerate a wide range of habitats. Suitable habitat in project area
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	VU	NT	Medium	Inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes	Medium	Wetlands and rivers occur within PAOI. Suitable habitat in project area.

2.8.3.4 **AVIFAUNA**

SABAP2 data indicate that 354 avifauna species are expected for the PAOI and surrounding areas. The Avifauna list was generated from the SABAP2. Of these 348 avifauna species, 40 are considered SCC (Table 11). The likelihood of occurrence within the PAOI is included here. The DFFE screening tool lists two (2) high-sensitivity species and four (4) medium-sensitivity species (41 in total). The likelihood of occurrence of these species will be determined following the site visit.

Table 11: Threatened avifauna species that are expected to occur within the PAOI; LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered

Common Name	Scientific Name	Regional	Global	Screening Tool	Likelihood of Occurrence
Half-collared Kingfisher	*Alcedo semitorquata*	VU	LC		Low
Red-billed Teal	*Anas erythrorhyncha*	NT	LC		High
Yellow-billed Duck	*Anas undulata*	NT	LC		High
African Darter	*Anhinga rufa*	NT	LC		High
Blue Crane	*Anthropoides paradiseus*	VU	VU		Low
Verreaux's Eagle	*Aquila verreauxii*	VU	LC		High
Great Egret	*Ardea alba*	NT	LC		High
Marsh Owl	*Asio capensis*	NT	LC		High
Curlew Sandpiper	*Calidris ferruginea*	VU	VU		Medium
Kittlitz's Plover	*Charadrius pecuarius*	NT	LC		High
Black Stork	*Ciconia nigra*	EN	LC		Low

Common Name	Scientific Name	Regional	Global	Screening Tool	Likelihood of Occurrence
Pallid Harrier	*Circus macrourus*	NA	NT		Medium
Black Harrier	*Circus maurus*	EN	EN		Low
African Marsh Harrier	*Circus ranivorus*	VU	LC	High/Medium	High
European Roller	*Coracias garrulus*	NT	LC		Medium
Fulvous Whistling Duck	*Dendrocygna bicolor*	NT	LC		High
Black-winged Kite	*Elanus caeruleus*	NT	LC		High
White-bellied Bustard	*Eupodotis senegalensis*	VU	LC	Medium	Medium
Lanner Falcon	*Falco biarmicus*	NT	LC		Medium
Lesser Kestrel	*Falco naumanni*	VU	LC		Medium
Red-footed Falcon	*Falco vespertinus*	VU	VU		Low
Black-winged Pratincole	*Glareola nordmanni*	LC	NT		Low
White-backed Vulture	*Gyps africanus*	CR	CR		Low
Cape Vulture	*Gyps coprotheres*	VU	VU		High
Caspian Tern	*Hydropogne caspia*	VU	LC	High/Medium	Medium
Lesser Jacana	*Microparra capensis*	NA	LC		Low
Melodious Lark	*Mirafra cheniana*	NT	LC		Medium
Sentinel Rock Thrush	*Monticola explorator*	LC	NT		Low
Yellow-billed Stork	*Mycteria ibis*	VU	LC		High
Southern Pochard	*Netta erythrophthalma*	NT	LC		High
Black-crowned Night Heron	*Nycticorax nycticorax*	NT	LC		High
Maccoa Duck	*Oxyura maccoa*	VU	EN		Medium
Lesser Flamingo	*Phoeniconaias minor*	VU	NT		High
Greater Flamingo	*Phoenicopterus roseus*	NT	LC		High
Great Crested Grebe	*Podiceps cristatus*	VU	LC		High
Secretarybird	*Sagittarius serpentarius*	VU	EN		Medium
Knob-billed Duck	*Sarkidiornis melanotos*	NT	LC		Medium
Hamerkop	*Scopus umbretta*	NT	LC		High
Cape Shoveler	*Spatula smithii*	NT	LC		High
White-backed Duck	*Thalassornis leuconotus*	NT	LC		High
African Grass Owl	*Tyto capensis*	VU	LC	Medium	Low

2.9 WETLANDS

Sixteen (16) HGM types were identified within the 500 m PAOI (Figure 25), namely, three (3) channelled valley-bottom (CVB) wetlands, five (5) unchannelled valley-bottom (UVB) wetlands and eight (8) seep wetlands. All identified wetlands intersect with the proposed project site, except for three seep wetlands, namely, HGM 9, HGM 13, and HGM 14. Additionally, non-perennial drainage features, dams, and other artificial features were also identified within the PAOI.

All identified natural freshwater features within the assessment area were delineated as part of this assessment. Areas associated with existing TSFs and other mining-related disturbance are largely artificial or highly modified and were therefore assessed and delineated only insofar as necessary to inform the specialist findings. This limitation does not materially affect the outcome of the assessment, and the available information is considered sufficient for impact assessment and decision-making.

A functional description and assessment have been provided for all the identified natural wetland systems located within and/or proximal to the proposed project site and within the PAOI. Representative photographs of the water features within the project footprint are included as Figure 26

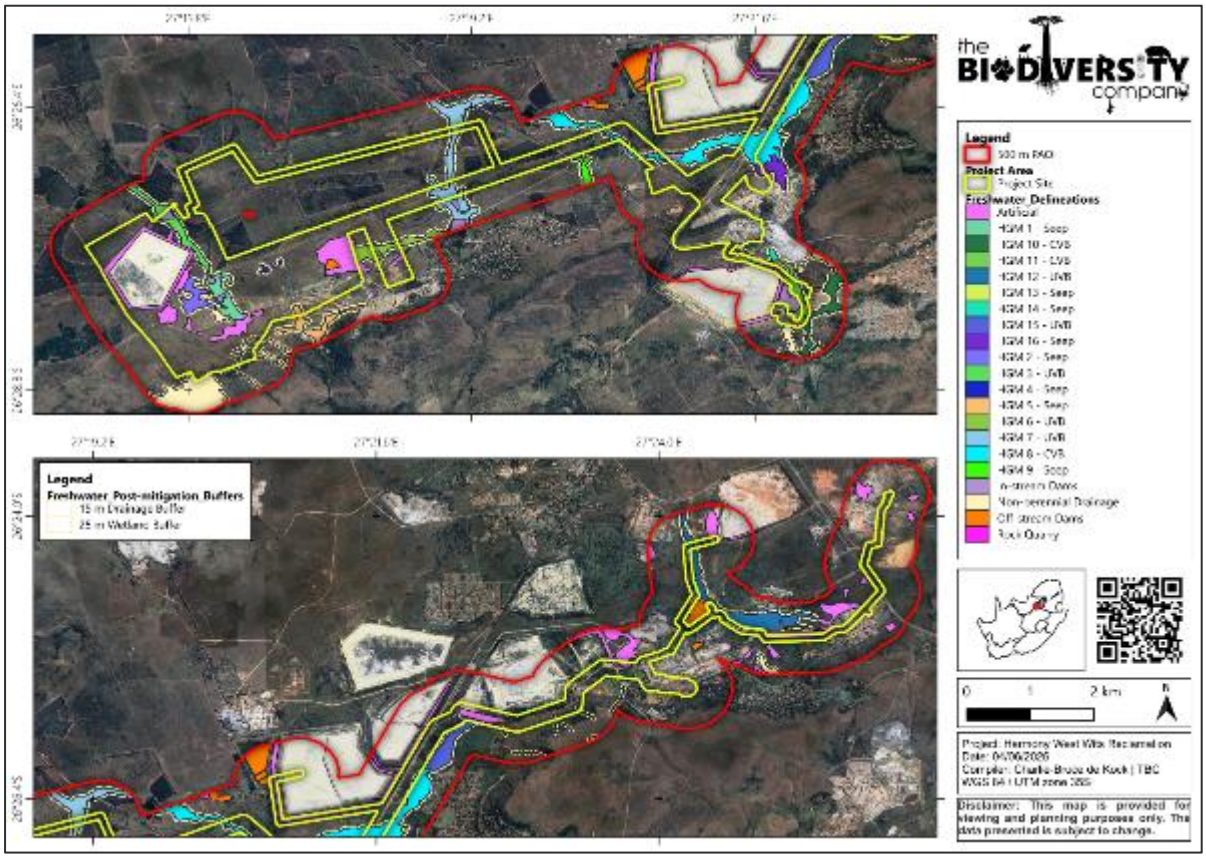


Figure 25: Delineation of wetlands and artificial features within the project footprint and 500 m project area of influence

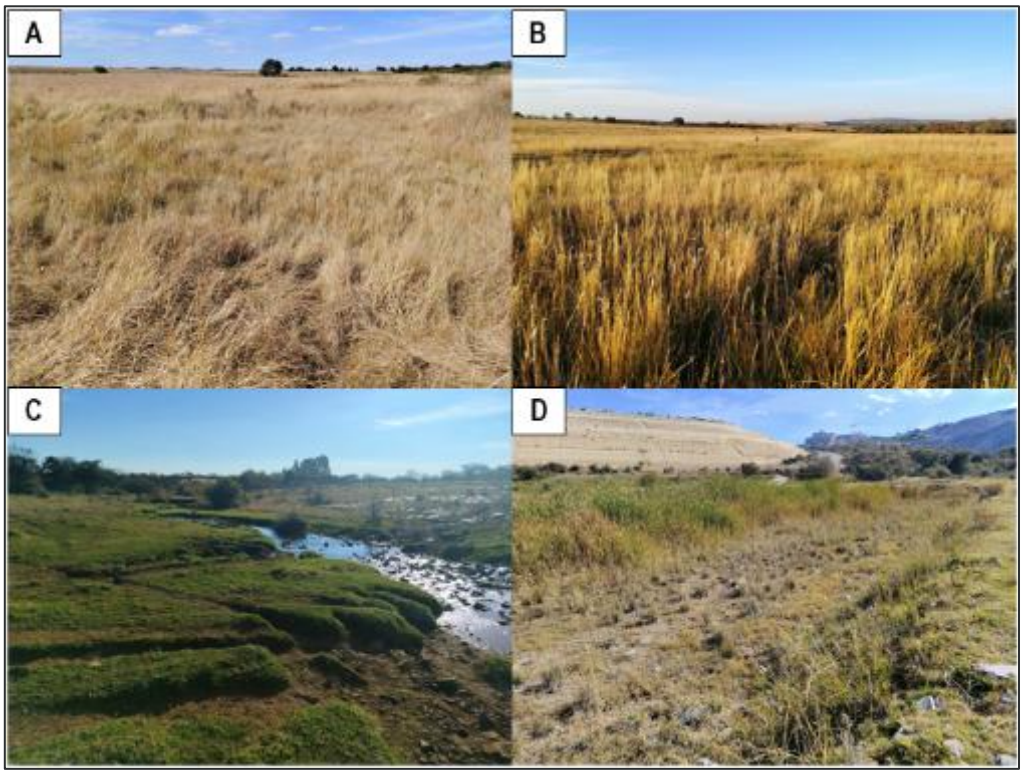


Figure 26: Representative photographs of the water features within the project footprint. A) HGM 1 Seep; B) HGM 6 UVB; C) HGM 8 CVB; and D) HGM 11 CVB

2.9.1 CLASSIFICATION AND DESCRIPTION

The wetland classification as per SANBI guidelines (Ollis *et al.,* 2013) is presented in Table 12.

Table 12: Wetland classification as per SANBI guideline (Ollis et al., 2013)

Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1 – 2 **HGM 4 – 5** **HGM 9** **HGM 13 – 14** **HGM 16**	Inland	Highveld	Central Bushveld Group 1	Hillslope	Seep	With Channelled Outflow	N/A
						Without Channelled Outflow	
HGM 3 **HGM 6 – 7** **HGM 12** **HGM 15**				Valley floor	Unchannelled Valley-bottom	N/A	N/A



Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 8 **HGM 10 – 11**					Channelled Valley-bottom	N/A	N/A

A seep wetland is typically located on gently to steeply sloping land and is characterised by the colluvial, unidirectional movement of water and material down-slope (Ollis *et al.,* 2013). Seeps are often found on the side-slopes of a valley but do not usually extend onto the valley floor. The primary water inputs for seeps are subsurface flows from an up-slope direction, with water movement through the seep mainly occurring as interflow. During and after rainfall events, diffuse overland flow, known as sheetwash, can also be significant. Seeps are associated with geological formations and topographic positions that either cause groundwater to discharge to the land surface or rain-derived water to seep down-slope as subsurface interflow. This unique hydrological setting allows seeps to support specific vegetation adapted to these conditions, contributing to their ecological significance in the landscape.

An unchannelled valley-bottom wetland, is a wetland located on a valley floor, characterised by the absence of a distinct river channel (Ollis et al., 2013). These wetlands are defined by their diffuse water flows, which are not confined within channel banks, allowing water to spread across the valley floor. The primary water inputs for unchannelled valley-bottom wetlands include diffuse surface and subsurface flows from upstream channels that lose confinement, as well as seepage from adjacent valley side-slopes. The hydrodynamics of these wetlands are dominated by horizontal, unidirectional, diffuse surface flow, although infiltration and evapotranspiration can also be significant. This setting allows unchannelled valley-bottom wetlands to function as important sites for sediment deposition, water filtration, and habitat provision, supporting a diverse range of plant and animal species. Their unique hydrological and geomorphological characteristics make them vital components of the landscape, contributing to the overall ecological health of the valley systems in which they occur.

A channelled valley-bottom wetland, is a wetland ecosystem located along a valley floor, characterised by the presence of a river channel running through it (Ollis *et al.,* 2013). These wetlands are distinct from floodplain wetlands due to the absence of characteristic floodplain features and the presence of a defined river channel. The landscape setting of a channelled valley-bottom wetland typically involves a valley floor where the wetland receives water inputs from the river channel, either as surface flow during flooding or as subsurface flow, and from adjacent valley side-slopes through overland flow or interflow. The hydrodynamics of these wetlands are influenced by the river channel, which provides a concentrated flow of water, contributing to the wetland's ecological functions such as sediment trapping, nutrient cycling, and habitat provision. This setting makes channelled valley-bottom wetlands crucial for maintaining the ecological integrity of riverine systems and supporting biodiversity.

2.9.2 WETLAND FUNCTIONAL AND ECOLOGICAL ASSESSMENT

Only natural systems were considered for further assessments; therefore, any artificial features do not form part of the assessments presented below. In-stream dams associated with wetlands were regarded as components of the broader natural systems within which they occur, rather than being assessed as separate systems.

The assessment of non-perennial drainage features usually focuses on their role in landscape connectivity, sediment transport, and their potential to convey water and pollutants during episodic flow events. While they are considered as watercourses and should be managed to prevent degradation, the detailed ecological assessments (EIS, PES, REC) are not undertaken because these tools are not designed for, nor do they yield relevant results for, features that lack persistent aquatic ecosystem attributes. Wetlands on the other hand have semi-permanent or permanent aquatic ecosystem attributes which makes these assessments relevant.



2.9.3 FUNCTIONAL ASSESSMENT

Hillslope seep wetlands are typically found on hillsides where water emerges from subsurface flows, creating a diffuse downslope movement. These wetlands are primarily fed by groundwater discharges, although surface water contributions can also supplement flows. Hillslope seeps are particularly effective in water quality enhancement, notably in the removal of excess nutrients and pollutants such as nitrates, through processes like denitrification. This is facilitated by the wetland's vegetation, which provides organic carbon necessary for microbial processes that assimilate these nutrients. The vegetation also plays a critical role in stabilizing the soil, thereby reducing erosion risks, although the generally steep slopes of hillslope seeps can increase erosion susceptibility if vegetation cover is compromised. Additionally, these wetlands contribute to streamflow regulation by slowing down subsurface water movement, which prolongs water contribution to stream systems during low flow periods, although their flood attenuation capacity is limited once the soils are saturated (Kotze et al., 2009).

Unchannelled valley-bottom wetlands are characterised by their location in valley bottoms without a distinct stream channel, resulting in diffuse water flow across the wetland. These wetlands are highly effective in sediment trapping due to their gentle gradients and the extensive areas that remain permanently saturated, which promote the deposition of sediments carried by runoff waters. The high levels of soil organic matter in these wetlands enhance their capacity for nitrate and toxicant removal, as the prolonged contact with runoff waters facilitates these processes. However, phosphate retention may be lower compared to other wetland types due to potential remobilization under prolonged anaerobic conditions. Unchannelled valley-bottom wetlands also contribute to streamflow regulation to some extent, although this is influenced by factors such as vegetation transpiration and soil characteristics. These wetlands play a crucial role in maintaining water quality and providing habitat for diverse species, making them vital components of the landscape (Kotze et al., 2009).

Channelled valley-bottom wetlands are characterised by their location in valley bottoms with a well-defined stream channel. These wetlands play a crucial role in hydrological processes, particularly in flood attenuation and sediment trapping. The presence of a channel allows for the movement of water, which can contribute to the regulation of streamflow, especially during periods of low flow. The vegetation in these wetlands provides resistance to water flow, thereby slowing down the movement of water and allowing for the deposition of sediments. This process not only helps in maintaining water quality by trapping sediments and associated nutrients but also supports the wetland's role in flood attenuation by spreading out and slowing down floodwaters. Additionally, channelled valley-bottom wetlands can contribute to the removal of nitrates and toxicants from the water, enhancing the overall water quality in the catchment area. These wetlands are integral to maintaining the ecological balance and providing essential ecosystem services, such as water purification and habitat provision for various species (Kotze et al., 2009).

Non-perennial rivers and drainages, as documented by Kotze et al. (2009), are characterised by their intermittent flow patterns, which are not sustained throughout the year. These systems are crucial for flood attenuation, particularly during periods of flow, as their channels allow for the temporary storage and slow release of water. This attenuation is most effective when the riverbed and surrounding soils are not fully saturated. The deposition of sediments and organic material within these systems contributes to the retention of water, thereby enhancing the capacity to moderate flow variability. Non-perennial drainages also play a role in nutrient cycling, particularly in the assimilation of nitrates through processes such as denitrification, facilitated by the organic matter present. These features improve water quality by trapping sediments and assimilating excess nutrients and pollutants from agricultural and industrial sources. Although their capacity for erosion control is limited due to their intermittent nature, non-perennial systems provide ecosystem services by connecting various aquatic habitats and supporting biodiversity during wet periods.

It should be noted that these characteristics are representative of ideal wetland features and may not necessarily represent the characteristics of all wetlands. The functionality of wetlands and the provision of benefits is largely dependent on wetland size and influence from abiotic drivers.

The ecosystem services provided by the relevant wetland units on site were assessed and rated using the WET-EcoServices method (Kotze et al., 2020). The results of the assessment are presented in Table 13. The average

ecosystem services scores fall within the range of “Moderately-Low” to “Moderately-High”. Ecosystem services contributing to these scores include flood attenuation, streamflow regulation, sediment trapping, erosion control, phosphate assimilation, nitrate assimilation and toxicant assimilation.

Table 13: Summary of the average ecosystem scores for the assessed systems

Moderately-Low	Moderate	Moderately High
HGM 2	HGM 1	HGM 7
HGM 4	HGM 3	HGM 8
HGM 14	HGM 5	HGM 10
	HGM 6	
	HGM 9	
	HGM 11	
	HGM 12	
	HGM 13	
	HGM 15	
	HGM 16	

Wetlands in the Moderately-Low category are primarily seep systems that have been substantially transformed by surrounding mining-related disturbance. Their compromised ecological condition, limited wetland vegetation cover, and reduced natural hydrological functioning constrain their ability to provide ecosystem services. As a result, their capacity to support regulating services such as sediment trapping, water quality enhancement, erosion control, and carbon storage, as well as habitat-related functions, is limited. These systems also show partial to negligible connectivity with larger wetland or drainage networks, further restricting their contribution to broader functions such as streamflow regulation, flood attenuation, and biodiversity support. Where connectivity does occur, it is often influenced by artificial runoff and other mining-related inputs, which further reduce the naturalness of hydrological linkages. Collectively, these factors indicate a limited ecosystem service supply relative to more intact wetland systems.

Wetlands in the Moderate category comprise a mix of seeps, unchannelled valley-bottoms (UVBs), and channelled valley-bottoms (CVBs). These systems generally display greater hydrological connectivity, more wetland vegetation, and more evident hydrological functioning than the Moderately-Low group, enabling a broader range of services to be delivered. In particular, they retain a moderate capacity to support streamflow regulation, flood attenuation, sediment retention, water quality improvement, and habitat support. Despite this, these wetlands remain heavily compromised by surrounding mining activities, which have altered their natural state, reduced ecological integrity, and weakened overall service delivery. Mining-related disturbance and associated artificial inputs have modified hydrological pathways and reduced naturalness, with the result that, although these systems remain more functional than the more degraded seep systems, their ecological capability is still materially reduced relative to wetlands in a more natural condition.

Wetlands in the Moderately-High category comprise predominantly channelled valley-bottoms (CVBs) and one unchannelled valley-bottom (UVB) system. These wetlands are relatively more intact than the other assessed systems, with greater wetland vegetation cover, stronger hydrological connectivity, and closer association with larger wetland systems. Consequently, they retain a comparatively stronger capacity to provide ecosystem services, particularly streamflow regulation, flood attenuation, sediment trapping, water quality improvement,

carbon sequestration, and biodiversity support. Their improved vegetation structure and hydrological functioning also indicate a greater ability to sustain regulating and supporting services at a broader landscape scale. Nevertheless, these systems are still located within a mining-influenced landscape and are therefore not fully intact. Even so, relative to the Moderately-Low and Moderate groups, they represent the better-functioning wetlands within the study area, with a higher capacity for ecosystem service delivery and ecological resilience.

2.9.4 PRESENT ECOLOGICAL STATE

The wetlands exhibited different degrees of modification resulting from natural physical changes as well as anthropogenically induced impacts at both the local and catchment level. As a result, the wetlands have an average Present Ecological State (PES) score within the "E – Seriously Modified" and "D – Largely Modified" PES classes. The results of the wetland health and integrity assessment is provided in the table below.

Table 14: Average Present Ecological State scores for the assessed wetlands

E – Seriously Modified	D – Largely Modified
HGM 1	HGM 4
HGM 2	HGM 7
HGM 3	HGM 9
HGM 5	HGM 10
HGM 6	HGM 13
HGM 8	
HGM 11	
HGM 12	
HGM 14	
HGM 15	
HGM 16	

2.9.5 ECOLOGICAL IMPORTANCE AND SENSITIVITY

The Ecological Importance and Sensitivity (EIS) assessment was applied to the HGM units in conjunction with the ecosystem service scores in the preceding sections, to assess the levels of sensitivity and ecological importance of the wetland. The results indicate that the wetlands occur within the "High" EIS classes as noted in the table below.



Table 15: Summary of the Ecological Importance and Sensitivity assessment

HGM	NFEPA Wet Veg			NBA Wetlands			SWSA (Y/N)	CBA / ESA (Y/N)	EIS Rating
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018	Ecosystem Protection Level			
HGM 1 HGM 2 HGM 5 HGM 14 HGM 16	Central Bushveld Group 1	Endangered	Poorly Protected	E (Field Visit)	Critically Endangered	Not Protected	N	Y	B – High
HGM 4 HGM 9 HGM 13				D (Field Visit)			N	Y	B – High
HGM 3 HGM 6 HGM 8 HGM 11 HGM 12 HGM 15		Critically Endangered	Not Protected	E (Field Visit)			N	Y	B – High
HGM 7 HGM 10				D (Field Visit)			N N	Y	B – High

2.9.6 RECOMMENDED ECOLOGICAL CATEGORY AND RECOMMENDED MANAGEMENT OBJECTIVE

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) for the wetland areas was determined from the results of the PES and EIS assessments. These assessments indicated that the wetland feature within the site, had underwent transformation as a result of historical and current impacts. Nevertheless, despite the altered ecological integrity of the systems, they are considered to provide ecological services.

The results of the assessment are presented in the table below. The objective for the wetlands is to improve the current PES of all wetlands.

Table 16: Recommended Ecological Category and Management Objective

HGM No.	Recommended Ecological Category	Recommended Management Objective
HGM 1 **HGM 2** **HGM 3** **HGM 5** **HGM 6** **HGM 8** **HGM 11** **HGM 12** **HGM 14** **HGM 15** **HGM 16**	E/F	Improve
HGM 4 **HGM 7** **HGM 9** **HGM 10** **HGM 13**	C/D	Improve

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane et al., 2014). The recommended buffer zones are presented in Figure 27. The recommended post-mitigation buffers for the construction and operational phase of the development are 25 m for the floodplain wetlands and 15 m for the non-perennial watershed features as presented in Table 17.

Table 17: Recommended buffers for the proposed development

Features	Pre-Mitigation	Post-Mitigation
Wetlands	50	25
Non-perennial Watershed features	30	15



As the proposed project layout overlaps with multiple wetlands and their recommended buffer, the buffer must be used as a key constraint to guide the detailed layout design and micro-siting of infrastructure. Where avoidance is not feasible, any encroachment into the buffer should be specifically motivated, minimised, and supported by appropriate mitigation and rehabilitation measures to maintain wetland functionality and reduce risk to the receiving environment.

Furthermore, according to the GDARDE requirements for Biodiversity (GDARDE, 2012), buffers are typically prescribed to protect aquatic ecosystems from the impacts of adjacent land uses. The standard guideline recommends a minimum buffer of 50 metres from the edge of a wetland or watercourse in rural settings and a minimum buffer of 30 m metres from the edge of a wetland or watercourse in urban settings measured from the delineated boundary of the feature.

The specialist-assigned 25 m buffer is deemed suitable and sufficient for the proposed development in accordance with the Buffer Zone Guidelines (Macfarlane and Bredin, 2017). However, any relaxation on the GDARDE buffers must be approved by the Competent Authority.

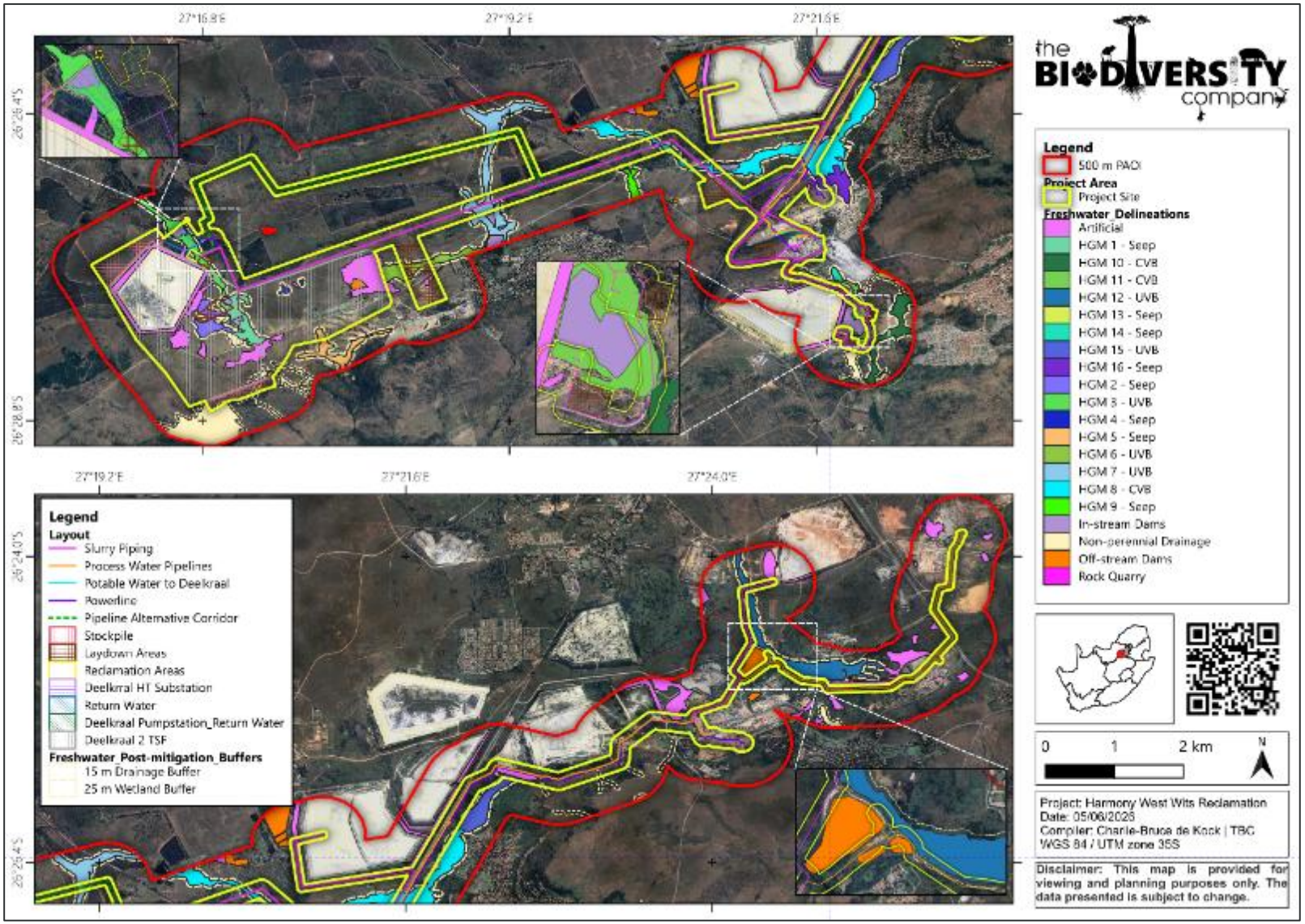


Figure 27: Recommended post-mitigation buffers for the identified wetlands in relation to the proposed project footprint.

2.10 HYDROLOGY

The Mooirivierloop is a perennial river situated north-east of the study area in quaternary catchment C23E which approximates 850 km2 in area. The Loopspruit River is also a perennial river, it is situated to the south of the study area in quaternary catchment C23J which approximates 890 km^2 in area. The contributing catchment of the Loopspruit River was derived from the 30m DSM. Figure 28 illustrates the hydrological setting of the site.

The site is positioned primarily within quaternary catchments C23E and C23J however, the area of hydrological relevance encroaches on catchment C23G. The nearest rivers are the Mooirivierloop River to the north-east of the site, and the Loopspruit River situated to the south. According to the NGI's 1:50,000 topographical map data; water drains from the site to both rivers through channels and non-perennial rivers. The NGI's 1:50,000 topographical map data illustrates numerous non-perennial river systems to the north and south, both of which converge to the southwest of the site into the Mooirivier.

The northern system is associated with multiple vleis along the Mooirivierloop channel to the north and dams both north and south of the site. There are upstream furrows directing runoff from part of the greater Mponeng Operation (south of the Old North Complex TSF) and along the Mponeng TSF trenches draining to the non-perennial rivers to the west. The southern system is characterised by two larger dams, one of which is listed as the proposed return water dam for the Mponeng TSF. There are two dams to the west, one that connects to the Mooirivierloop network and is the proposed alternative location for the Return Water Dam to the south of the proposed Deelkraal TSF. This proposed return water dam sits at the headwaters of the non-perennial tributary connecting to the Loopspruit river.

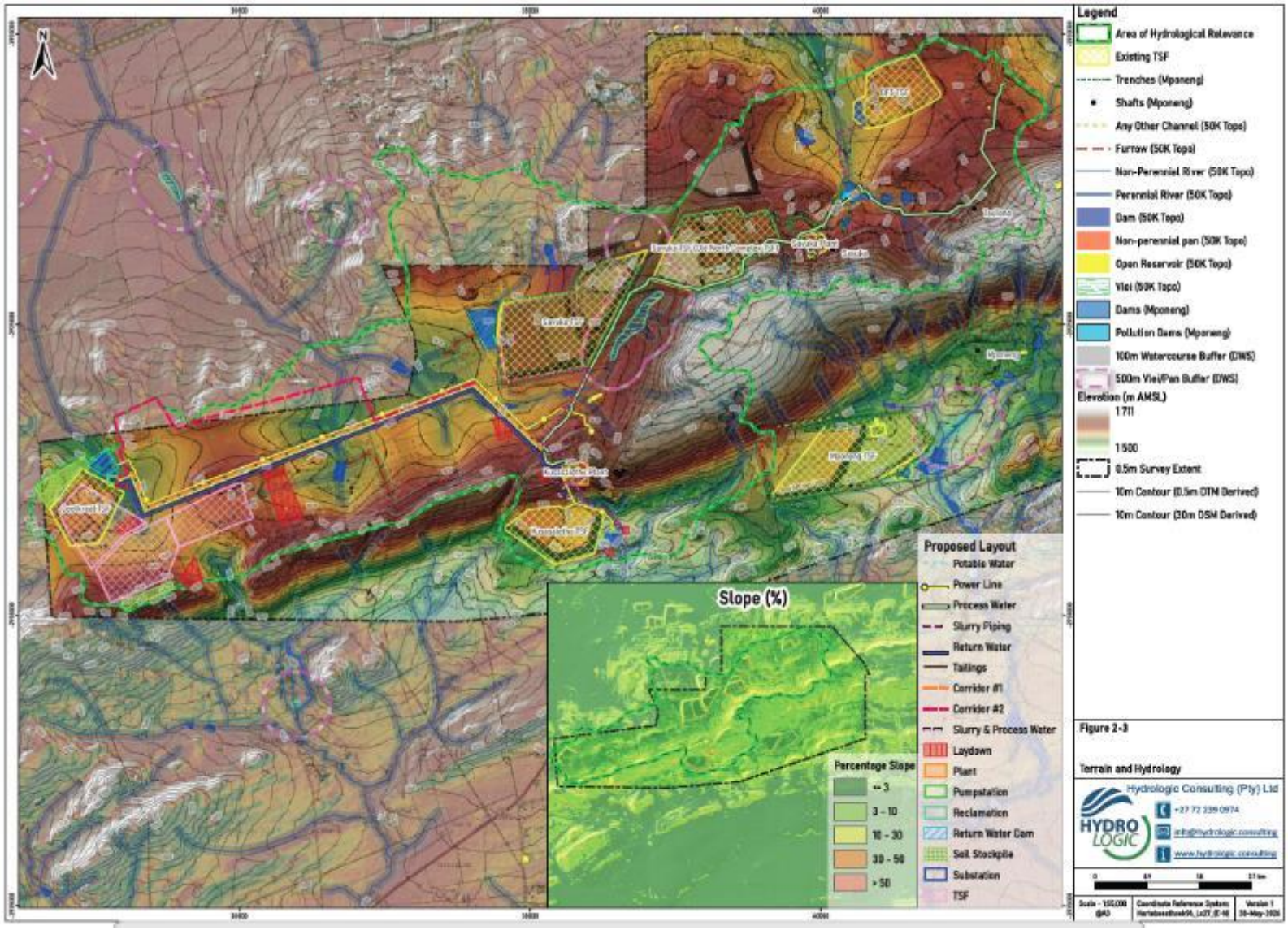


Figure 28: Terrain and Hydrology

Sensitivity mapping was undertaken to identify sensitive features relating to the hydrological (surface water) environment within the study area. A 1000 m buffer of the proposed Harmony West Wits Reclamation and Deposition Project was used as the area under consideration.

The trenches provided by the client for the layout indicate that a trench is situated along the original furrow line, which connects the non-perennial river system. In accordance with the topographic 1:50,000 map, this required the use of the aerial imagery, which provided clarification on this. 'Any other channels' and 'furrows' that appeared not to have a hydrological upstream connection were included only when draining to a natural dam, as indicated by the 1:50,000 dam dataset DWS.

The Department of Water Affairs and Forestry (now the Department of Water and Sanitation) established GN 704 to provide regulations on the use of water for mining and related activities aimed at protecting water resources. This includes the following condition:

Condition 4 – Restrictions on locality – No person in control of a mine or activity may:

(e) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;

The 100 m watercourse buffer is consequently one of the main guiding aspects in the assessment of site sensitivities given its relevance to GN 704, and its applicability to both flooding and the potential for contaminants to enter a watercourse (i.e., a wider river buffer is more likely to keep infrastructure/works outside of areas prone to regular or irregular flooding while enabling more time for containments within runoff, to settle out before entering the watercourse). A 100 m watercourse buffer distance is, however, limited in its application since the proposed works/infrastructure will either fall within or outside of the buffer distance, with no grading in site sensitivity possible. An expanded approach to the 100 m river buffer was consequently adopted, utilising a variation in buffer distances modelled by flooding and contour analysis.

Buffers have been derived from the 1:50,000 topographical map watercourse features. Open and closed reservoirs have been excluded on the basis that inflows are managed (and that there is no significant upslope catchment area of relevance). Watercourse buffers are technically applicable from the edge (top of bank) of the watercourse and not from the centreline (as in the case of rivers, drainage canals, and furrows). The absence of a channel survey means that the river/furrow centreline has nevertheless been used to define buffers.

The following sensitivity bands were classified:

- Prevent Development[1]
    - A 32 m watercourse buffer (also applicable to NEMA activities) was used to define the functional area of the watercourse.
    - This 32 m buffer factors in the potential error in the 1:50,000 topographical map dataset.
    - All development should be prevented in this area unless water-compatible or otherwise crossing over a watercourse (with flood risk factored in).
- High
    - o The 1:100 RI defined flood-line (Project EIM-021) applies to both GN 704's and DWS Notice 4167 of 2023. The 1:100 RI event is a conservative estimate (where more flooding is conservative).
    - A 100m buffer distance matches GN 704's and DWS Notice 4167 of 2023 prescribed buffer distance and is the minimum distance to a watercourse requiring motivation if

[1] Please note that these are not considered no-go areas for development by the hydrologist. The hydrological features have been defined according to the NGI's 1:50,000 topographical map data, and the hydrology report does not intend to alter their classification, however the recommended mitigation measures must be implemented if development is to take place in these areas.

works/infrastructure are going to be permitted, including a written exemption from the Minister of the Department of Water and Sanitation.

- There is a strong disincentive towards development within this area.

- Medium
  - The 1:50 RI defined flood-line4 GN 704's and DWS Notice 4167 of 2023. The 1:50 RI event is moderately conservative (where more flooding is conservative).
  - A 200m buffer distance was included as an intermediate buffer distance between the 100m buffer distance above and the 500m buffer distance below.
  - There is a medium disincentive towards development within this area.
- Low
  - A 500 m buffer distance is a reasoned maximum distance from a watercourse, which in most instances will reflect the largest distance over which flooding would need to be considered.
  - DWS Notice 4167 of 2023 also outlines how a 500 m buffer distance applies to wetlands (which includes pans and vleis as present in this study area). This report, however, does not focus on wetlands and only considers the 1:50,000 topographical map of rivers.
  - There is a low disincentive towards development within this area.
- Remainder (Unclassified):
  - o There is no sensitivity classification for the remainder of the site.
  - GN 704 restricts development within 100 m of a watercourse (e.g., dam or river), and the above outline does not attempt to remove this restriction but is instead a high-level 'scaled' version of this buffer distance.

Refer to Figure 29 - Figure 31 for identified site sensitivities relating to the surface water environment.



Figure 29: Identified site sensitivities relating to the surface water environment (south western section)

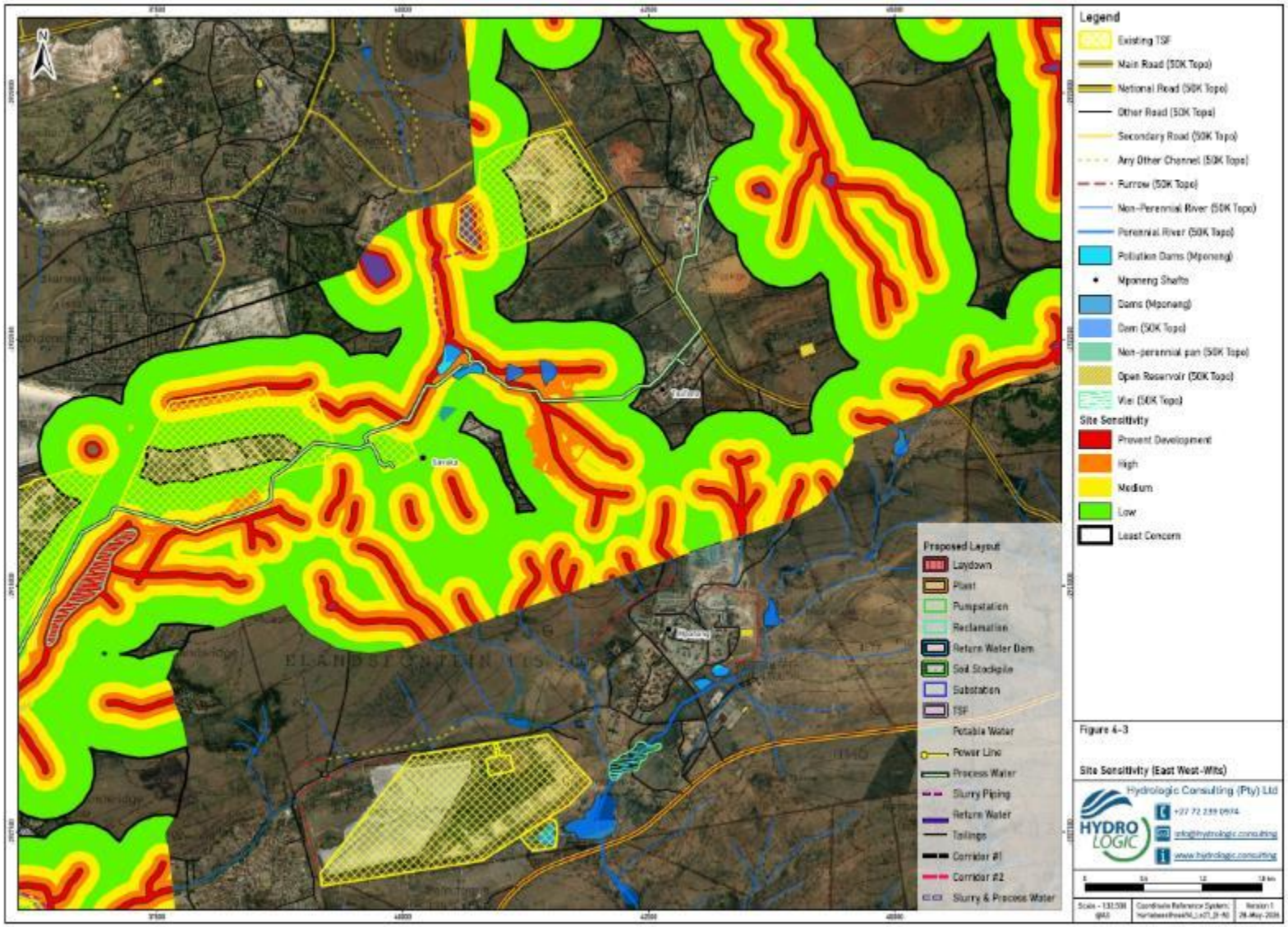


Figure 30: Identified site sensitivities relating to the surface water environment (middle section)

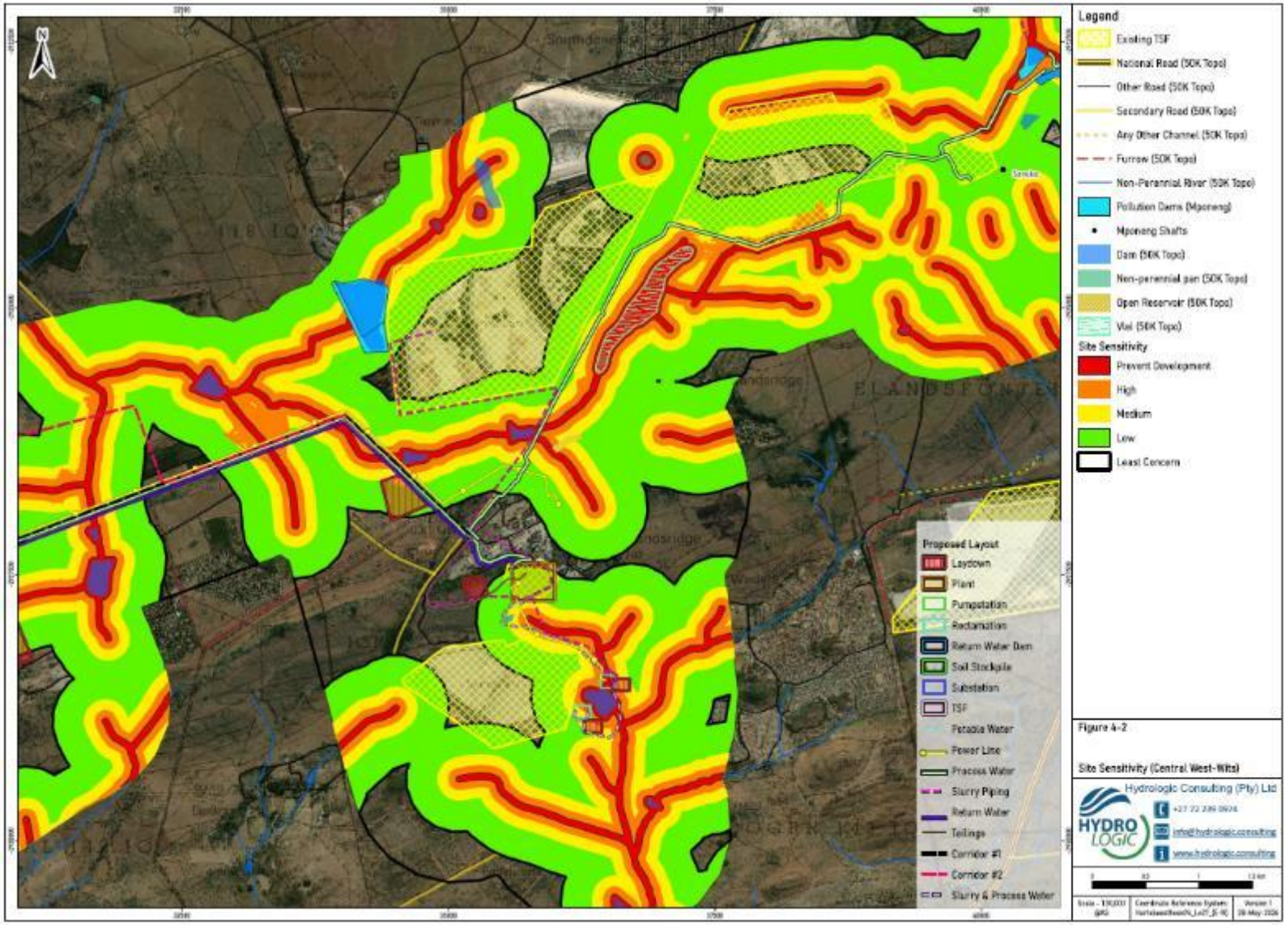


Figure 31: Identified site sensitivities relating to the surface water environment (north eastern section)

2.11 GROUNDWATER

Groundwater baseline information was provided by Marius van Biljon (geohydrologist) and the relevant information is presented in this section. A key aspect of any groundwater assessment is a thorough understanding of the groundwater resource. The groundwater resource is described according to the following criteria:

- Aquifer boundaries;
- Aquifer type;
- Aquifer parameters;
- Hydrochemistry;
- Aquifer recharge; and
- Aquifer classification.

2.11.1 HYDROCENSUS AND BOREHOLE INFORMATION

Auctus Consulting (Van Biljon, 2011) conducted a hydrocensus within a 2km radius of the Kusasalethu and Deelkraal TSF's in 2011. Several privately owned boreholes were identified in the southern catchment (C23J), but no privately owned boreholes were found in the northern catchment (C23E).

The hydrocensus points in relation to the Kusasalethu TSF are shown in Figure 32 and the hydrocensus information is summarised in Table 18. Although the hydrocensus was conducted in 2011 the mine has continued to monitor these boreholes. The hydrocensus boreholes are sampled bi-annually. The average 2024 groundwater chemistry is presented in Table 19 (Groundwater Complete, 2025).

The following is concluded in terms of the hydrocensus groundwater quality:

- Ten of the original hydrocensus boreholes are still actively monitored.
- Monitoring information shows that overall good groundwater quality conditions prevailed if compared with drinking water standards (SANS 241:2015).
- In terms of the WUL standards, groundwater qualities are mostly compliant.
- Most of the macro cations and anions occurred in higher concentrations in groundwater from the hydrocensus boreholes, which may be a result of aquifer heterogeneity and natural occurring interaction between the aquifer host rock/s and groundwater, or low-level impacts from the mining areas since the boreholes are located in the general downgradient groundwater flow directions.
- Groundwater is dominated by magnesium on the cation side, while bicarbonate alkalinity, sulphate and chloride dominate the anion content.
- Unacceptably high levels of bacteriological contamination were encountered in monitoring boreholes HYD2, HYD3, HYD11, HYD12, HYD13 and HYD14, rendering the groundwater unsafe for human consumption.



Figure 32: Hydrocensus borehole localities

Table 18: Hydrocensus boreholes

BH ID	Longitude	Latitude	Z	SWL (mbc)	BH Depth (m)	BH Use	Volume Abstracted (Lit/day)	Comments	Current Monitoring
HYD1	27.37586	-26.491	1453	No access	Unknown	Domestic	Unknown	Electric pump	Yes
HYD2	27.36794	-26.4834	1462	5.46	18	Domestic	2500	Electric pump.	Yes
HYD3	27.36665	-26.4807	1473	3.92	50	Domestic / Livestock	5000	Electric pump.	Yes
HYD4	27.3649	-26.4809	1481	9.92	48.15	Not used	0	Open BH.	Blocked
HYD5	27.36752	-26.4844	1477	5.21	39.52	Not used	0	Open BH.	Demolished
HYD6	27.36194	-26.4809	1489	19.69	Unknown	Not used	0	Electric pump, broken.	Damaged
HYD7	27.36213	-26.4802	1488	18.85	Unknown	Not used	0	Windmill, broken.	Yes
HYD8	27.36399	-26.4777	1490	11.57	Unknown	Not used	0	Electric pump, broken.	Yes
HYD9	27.36358	-26.4815	1479	17.29	40.93	Not used	0	Open BH.	Blocked
HYD10	27.36283	-26.4819	1479	18.62	Unknown	Domestic / Livestock	Unknown	Electric pump.	Demolished
HYD11	27.33925	-26.476	1515	No access	70	Domestic / Livestock	5000	Mono pump	Yes



BH ID	Longitude	Latitude	Z	SWL (mbc)	BH Depth (m)	BH Use	Volume Abstracted (Lit/day)	Comments	Current Monitoring
HYD12	27.33791	-26.4753	1504	1.68	28.71	Not used	0	Open BH.	Yes
HYD13	27.33738	-26.4748	1507	17.28	30	Domestic / Livestock	5000	Electric pump	Yes
HYD14	27.34026	-26.4743	1524	9.97	17.84	Not used	0	Windmill, broken.	Yes



Table 19: Hydrocensus groundwater chemistry (Groundwater Complete, 2025)

BH	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	MALK CaCO3/l	Cl mg/l	SO4 mg/l	NO3 mg/l	F mg/l	Al mg/l	Fe mg/l	Mn mg/l
HYD1	7.9	75.3	554.0	65.3	37.1	52.1	0.7	240.4	65.8	69.8	0.9	<0.466	<0.002	<0.009	0.016
HYD2	7.6	71.8	522.0	71.1	41.0	16.7	1.0	111.8	59.3	157.9	5.1	0.427	<0.002	<0.009	0.008
HYD3	8.2	76.0	646.0	81.3	49.8	28.0	0.4	160.7	83.4	174.0	1.9	<0.466	<0.002	<0.009	0.001
HYD7	7.9	53.4	420.0	49.3	32.2	26.5	1.5	168.8	47.9	56.3	1.1	<0.466	<0.002	<0.009	<0.001
HYD8	8.2	82.1	594.0	88.2	49.8	27.3	0.9	289.6	48.2	81.7	3.6	<0.466	<0.002	<0.009	<0.001
HYD11	7.1	38.0	300.0	31.3	14.3	19.7	1.6	34.2	79.1	33.1	<0.194	0.446	0.213	<0.009	<0.001
HYD12	6.6	23.1	158.0	15.4	13.9	7.4	0.3	26.1	54.2	0.2	0.5	0.252	<0.002	<0.009	0.282
HYD13	6.5	3.8	18.0	3.5	2.3	1.1	0.1	16.6	0.7	<0.452	0.5	<0.466	0.004	<0.009	0.007
HYD14	8.0	45.2	298.0	66.9	14.4	11.3	0.9	161.5	30.7	27.6	0.5	0.285	<0.002	<0.009	0.057
BH	NH4 mg/l	Thard mg/l	B mg/l	Ba mg/l	Cd mg/l	Co mg/l	Cr mg/l	Cu mg/l	Ni mg/l	Pb mg/l	U mg/l	V mg/l	Zn mg/l	T.coli/ 100ml	E.coli/ 100ml
HYD1	0.036	315.9	0.047	0.035	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.045	<0.005	3	0
HYD2	<0.008	346.1	<0.013	<0.002	<0.002	0.016	<0.007	0.020	<0.005	<0.009	<0.015	<0.002	0.024	47000	11000
HYD3	0.071	408.0	<0.013	0.004	<0.002	0.018	<0.007	<0.005	<0.005	<0.009	<0.015	0.002	0.028	13	0
HYD7	0.169	255.8	<0.013	<0.002	<0.002	<0.003	<0.007	0.012	<0.005	<0.009	<0.015	0.025	<0.005	0	0



BH	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	MALK CaCO3/l	Cl mg/l	SO4 mg/l	NO3 mg/l	F mg/l	Al mg/l	Fe mg/l	Mn mg/l
HYD8	0.028	425.5	-	-	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	-	0.039	0	0
HYD11	0.099	137.3	<0.013	0.064	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.020	<0.005	370	170
HYD12	0.015	95.7	<0.013	0.004	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.021	0.013	61	8
HYD13	0.025	18.2	<0.013	<0.002	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.004	0.014	1	1
HYD14	0.067	226.6	<0.013	0.010	<0.002	<0.003	<0.007	<0.005	<0.005	<0.009	<0.015	0.022	0.003	244	9

- *Red – Value exceeds SANS 241 drinking water limit.*
- *Maximum Total Coliform (T. coli) count allowed in drinking water is 10 per 100 ml (SANS 241:2015).*
- *No E. coli should be present in drinking water (SANS 241:2015).*

The mine has an extensive groundwater monitoring network and no additional boreholes were drilled during this investigation. The mine monitoring borehole localities are summarised in Table 20 and shown in Figure 33 and Figure 34. The localities for the boreholes were carefully selected to monitor the seepage from the waste facilities.

Table 20: Mine monitoring boreholes

Monitoring Point	Longitude	Latitude
Deelkraal TSF, RWD and WRD		
DKTSF(S)	27.27727	-26.4585
DKTSF(D)	27.27716	-26.4585
DKRWD(S)	27.27411	-26.4545
DKRWD(D)	27.27449	-26.4544
DKWRD(S)	27.30397	-26.4600
DKWRD(D)	27.30398	-26.4600
DK BH 2(S)	27.27344	-26.47165
DK BH 2(D)	27.27343	-26.47162
DK BH 4(S)	27.26806	-26.46283
DK BH 4(D)	27.26798	-26.46287
BH4	27.27662	-26.4552
BH5	27.30096	-26.46557
Kusasalethu TSF, RWD and WRD		
MBH14	27.36583	-26.4653
MBH15	27.36688	-26.4706
MBH16	27.36178	-26.4715
MBH17	27.35275	-26.4698
BH6	27.35982	-26.4599
BH7	27.36519	-26.4625
BH 8(S)	27.3664	-26.4756
BH 8(D)	27.3664	-26.4765
BH9	27.348	-26.467

Note: (S) denotes a shallow borehole monitoring the weathered aquifer

(D) denotes a deep borehole monitoring the fractured aquifer

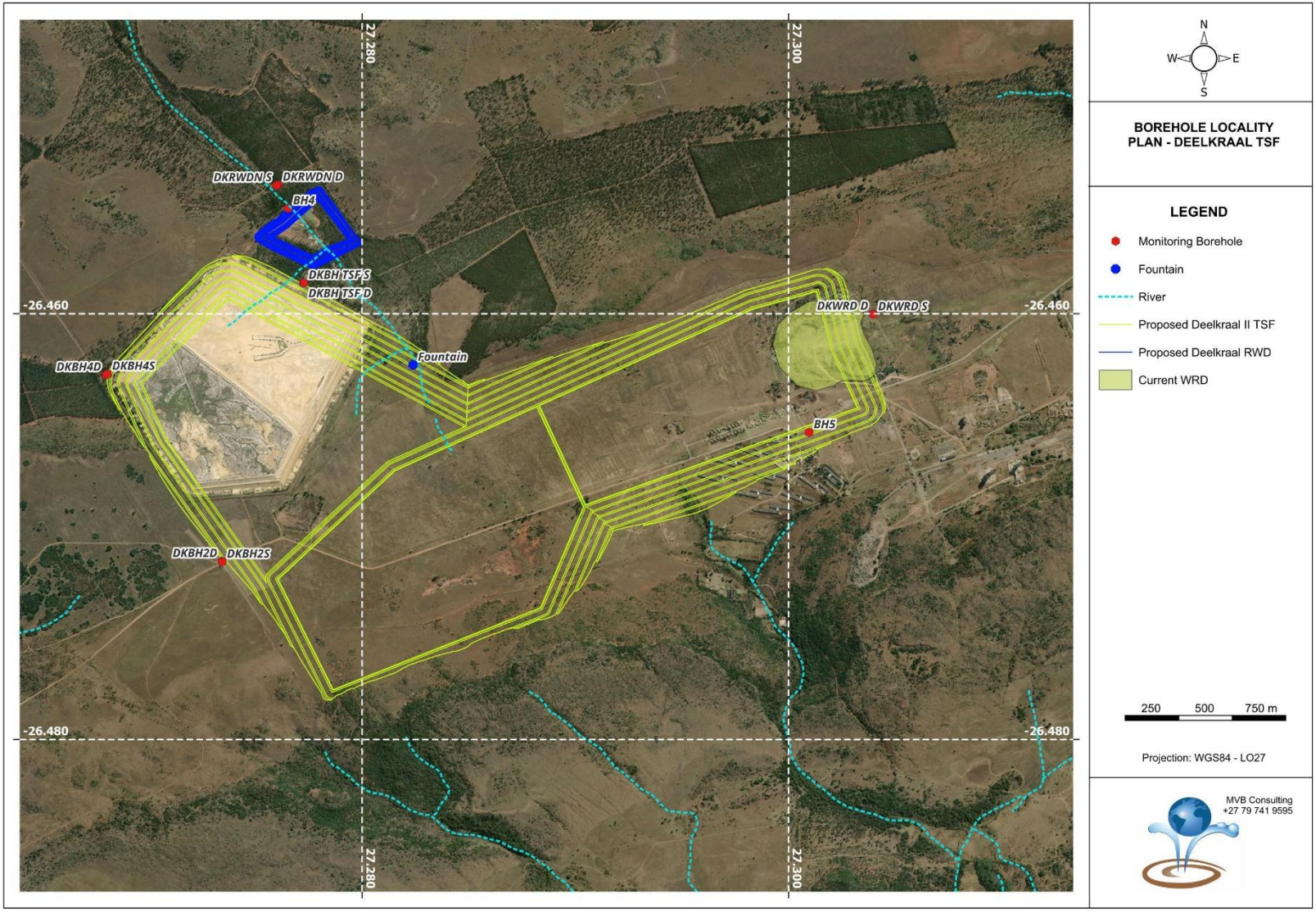


Figure 33: Deelkraal TSF monitoring boreholes



Figure 34: Kusasalethu Boreholes



2.11.2 AQUIFER TYPE

The geology of the region, apart from the Transvaal dolomite, is known to contain significant aquifers. Most groundwater occurrences are restricted to the upper weathered formations and fractures. These formations are not considered to contain economic and sustainable aquifers, but localised high yielding boreholes may, however, exist where significant fractures are intersected. Malmani dolomite is located north of the Kusasalethu mining area, these dolomites are known to contain significant groundwater. There are three distinct aquifers in the study area:

- Weathered Aquifer: The first is a shallow weathered aquifer, mainly restricted to the weathered shale and quartzite of the Witwatersrand rocks. The base of the aquifer is the impermeable quartzite and shale formations, whereas the top of the aquifer would be the surface topography. The groundwater table is affected by seasonal and atmospheric variations and generally mimics the topography. These aquifers are classified as semi-confined. The most consistent water strike is located at the fresh bedrock / weathering interface. Groundwater elevations vary between 0.5m and 14m below surface.
- Fractured Aquifer: The second is the deeper fractured rock aquifer. The deeper, fresh shale/quartzite aquifer where fracture flow dominates. Groundwater migration within the upper portion of the aquifer appears to be governed by jointing while major faults and intrusions form the significant conduits at depth. The depth to groundwater in this aquifer ranges from artesian to 38m below the surface. The two aquifers (weathered and fractured) are mostly hydraulically connected but confining layers such as clay and shale often separate the two. In the latter instance the fractured aquifer is classified as confined.
- Dolomitic Karst Aquifer: Carbonate rocks are practically impermeable and therefore devoid of any effective primary porosity. During its geological history, however, the dolomite is subjected to karstification and erosion. During this dissolution processes, the carbonate is removed from the dolomite and residual products such as silica, iron and manganese oxides and hydroxides (wad) are left behind. The residual mass spongy, compressible, of low density and has a high void volume. Fissures and caves also develop. Fault zones are preferential zones of weathering and are transformed into ground water conduits. The potential for large-scale ground water exploitation depends solely on the extent to which the dolomite has been leached by percolating rainfall and groundwater drainage, as well as the degree to which it has been transformed into aquifers capable of yielding significant quantities of water and sustaining high abstraction capacities.

The dolomite aquifer is unlikely to be impacted on by the activities at Kusasalethu, but it is near the Deelkraal TSF. The weathered and fractured aquifers are present beneath the entire Kusasalethu infrastructure, although the weathered aquifer may not always be well developed.

2.11.3 AQUIFER CLASSIFICATION

An aquifer classification system provides a framework and objective basis for identifying and setting appropriate levels of groundwater resource protection. This would facilitate the adoption of a policy of differentiated groundwater protection.

Other uses could include:

- Defining levels of investigation required for decision making.
- Setting of monitoring requirements.
- Allocation of manpower resources for contamination control functions.

The aquifer classification system used to classify the aquifers is the proposed National Aquifer Classification System of Parsons (1995). This system has a certain amount of flexibility and can be linked to second classifications such as a vulnerability or usage classification. Parsons suggests that aquifer classification forms a very useful planning tool that can be used to guide the management of groundwater issues. He also suggests that some level of flexibility should be incorporated when using such a classification system.



The South African Aquifer System Management Classification is presented by five major classes:

- Sole Source Aquifer System.
- Major Aquifer System.
- Minor Aquifer System.
- Non-Aquifer System.
- Special Aquifer System.

The following definitions apply to the aquifer classification system:

- Sole source aquifer system: “An aquifer that is used to supply 50 % or more of domestic water for a given area, and for which there are no reasonable alternative sources should the aquifer become depleted or impacted upon. Aquifer yields and natural water quality are immaterial”.
- Major aquifer system: “Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good”.
- Minor aquifer system: “These can be fractured or potentially fractured rocks that do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although this aquifer seldom produces large quantities of water, they are both important for local supplies and in supplying base flow for rivers”.
- Non-aquifer system: “These are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks does occur, although imperceptible, and needs to be considered when assessing risk associated with persistent pollutants”.
- Special aquifer system: “An aquifer designated as such by the Minister of Water Affairs, after due process”.

A second variable classification is needed for sound decision making, as the ability of an aquifer to yield water to a particular user is not adequately stated. In this case it was decided to use the vulnerability of the aquifer to contamination as a second parameter (Table 21). A weighting and rating approach is then used to decide on the appropriate level of groundwater protection (Table 22).

Table 21: Ratings for the aquifer quality management classification system

Class	Points	Class	Points
Sole Source Aquifer System	6	High	3
Major Aquifer System	4	Medium	2
Minor Aquifer System	2	Low	1
Non-Aquifer System	0		
Special Aquifer System	0-6		

Table 22: Appropriate level of groundwater protection required

GQM Index	Level of Protection
<1	Limited Protection
1 – 3	Low Level Protection
3 – 6	Medium Level Protection
6 – 10	High Level Protection
>10	Strictly Non-degradation

After rating the aquifer system management and the aquifer vulnerability, the points are multiplied to obtain a Groundwater Quality Management (GQM) index.

Based on the above, the aquifers in the study area are classified as follows:

Description	Aquifer	Vulnerability	Rating	Protection
Weathered Aquifer	Minor (2)	1	2	Low
Fractured Aquifer	Minor (2)	1	2	Low

2.11.4 AQUIFER PARAMETERS

Important aquifer parameters are obtained from borehole or test pumping and include Hydraulic Conductivity (K), Transmissivity (T) and Storativity (S). These parameters are defined as follows (Krusemann and De Ridder, 1991):

- Hydraulic Conductivity (K): This is the volume of water that will move through a porous medium in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. It is normally expressed in metres per day (m/day).
- Transmissivity (T): This is the rate of flow under a unit hydraulic gradient through a cross-section of unit width over the full, saturated thickness of the aquifer. Transmissivity is the product of the average hydraulic conductivity and the saturated thickness of the aquifer. Transmissivity is expressed in metres squared per day (m2/day).
- Storativity (S): The storativity of a saturated confined aquifer is the volume of water released from storage per unit surface area of the aquifer per unit decline in the component of hydraulic head normal to that surface. Storativity is a dimensionless quantity.

The calculated aquifer on previous investigations are presented in Table 23.

Table 23: Summarised aquifer parameters obtained from pump tests

Borehole	Transmissivity (m2/d)			Hydraulic Conductivity (m/d)		
	Kusasalethu TSF Boreholes					
	Constant Rate	**Recovery**	**Average**	**Constant Rate**	**Recovery**	**Average**
BH6	7.94 x 10-1	3.46 x 10-1	**5.70 x 10-1**	2.83 x 10-2	1.24 x 10-2	**2 x 10-2**

BH7	9.93 X 10-1	1.99 x 100	**1.49 x 100**	4.15 X 10-2	8.35 x 10-2	**6 x 10-2**
BH8D	4.32 x 10-1	1.33 x 10-1	**2.80 x 10-1**	1.56 x 10-2	4.78 x 10-3	**1 x 10-2**
BH8S	1.77 x 100	5.63 x 10-1	**1.17 x 100**	1.15 x 10-1	3.67 x 10-2	**9 x 10-2**
BH9	7.18 x 10-1	5.02 x 10-1	**6.10 x 10-1**	2.42 x 10-2	1.69 x 10-2	**2 x 10-2**
MBH14	9.93 x 10-1	1.01 x 10-1	**5.50 x 10-1**	5.02 x 10-2	5.12 x 10-3	**3 x 10-2**
	Deelkraal TSF Boreholes					
KBH1	2.8 x 10-1	1.49 x 10-1	**2.15 x 10-1**	7.99 x 10-3	4.24 x 10-3	**6.12 x 10-3**
DKBH 1S	Pumped dry	1.79 x 10-1	**1.79 x 10-1**	Pumped dry	1.89 x 10-2	**1.89 x 10-2**
DKBH 1D	4.42 x 100	2.95 x 100	**3.69 x 100**	1.47 x 10-1	9.84 x 10-2	**1.23 x 10-1**
DKBH 2S	Pumped dry	8.71 x 10-1	**8.71 x 10-1**	Pumped dry	1.45 x 10-1	**1.45 x 10-1**

Note: (S) denotes a shallow borehole monitoring the weathered aquifer, (D) denotes a deep borehole monitoring the fractured aquifer

The calculated parameters for the weathered and fractured aquifers are indicative of poorly developed aquifers that underlie the study area. These aquifers do not constitute economically sustainable and exploitable hydrological units. It is, however, important to note that individual fractures may yield higher volumes of water and flow rates may be faster within these features as seen in borehole DKBH1D.

2.11.5 GROUNDWATER GRADIENTS AND FLOW

Figure 35 depicts the groundwater level elevations which, as expected, mimic the surface contours. Groundwater flow is perpendicular to the groundwater contours and flows predominantly towards the south.

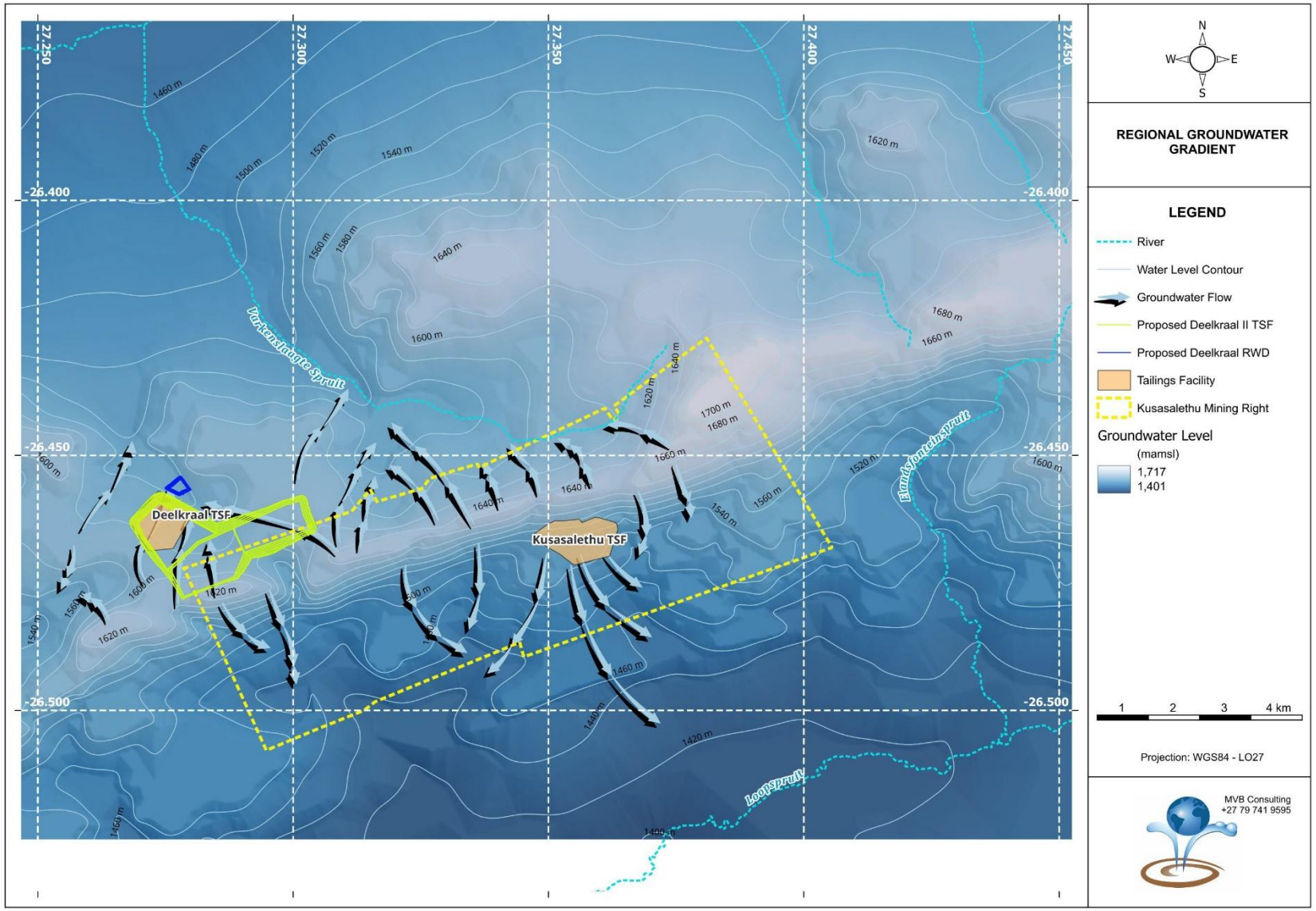


Figure 35: Regional groundwater gradient

2.11.6 GROUNDWATER QUALITY

Aquatico Scientific (Pty) Ltd routinely monitors the groundwater quality in the vicinity of the Kusasalethu and Deelkraal TSF's. The latest available data (September 2025) was made available and is used to assess the current impacts from the TSF's.

The groundwater quality is compared against the specified qualities in the Kusasalethu and Deelkraal Water Use License (WUL). The SANS 241 (2015) Drinking Water Guidelines is also included for comparative purposes. The SANS 241 Drinking Water Specification is the definitive reference on acceptable limits for drinking water quality parameters in South Africa and provides guideline levels for a range of water quality characteristics. The SANS 241 (2015) Drinking-Water Specification effectively summarises the suitability of water for drinking water purposes for lifetime consumption.

The chemistry of the groundwater is presented in Table 24 (Catchment C23E – Deelkraal TSF)) and Table 25 (Catchment C23J – Kusasalethu TSF). Values exceeding the WUL limits are highlighted in pink. The distribution of the sulphate (SO4) concentrations provides an aerial view of the impacted areas, which is as expected downgradient from the TSF's (Figure 36 and Figure 37).

Table 24: Groundwater chemistry (Deelkraal TSF)

Parameters	Units	Guidelines		Sampled Boreholes				
		WUL	SANS 241	DK BH TSF S	DK BH TSF D	DKRWDN S	DKWRD S	KL BH
pH @ 25°C	pH	5-9.7	≥5 to ≤9.7	8.29	7.14	6.24	8.53	6.06
Electrical conductivity (EC) @ 25°C	mS/m	<200	≤170	257	516	26	37	5
Total Dissolved solids @ 180°C	mg/l	<1200	≤1200	1 806	5 000	164	346	40
Turbidity	NTU	-	≤5	106.00	84.40	11.00	8.23	2.18
Total Alkalinity	mg $CaCO_3$/l	-	-	718	589	55	55	18
Calcium (Ca)	mg/l	<200	-	108.00	474.00	17.60	35.80	2.68
Magnesium (Mg)	mg/l	<100	-	207.00	605.00	8.22	18.20	2.54
Sodium (Na)	mg/l	<200	≤200	71.90	185.00	18.20	12.80	3.67
Potassium (K)	mg/l	-	-	28.60	16.10	3.45	3.29	1.12
Chloride (Cl)	mg/l	<300	≤300	80.30	158.00	21.10	22.60	3.37
Sulphate (SO4)	mg/l	<600	≤500	554.00	3 101.00	51.20	91.80	1.22
Fluoride (F)	mg/l	<1	≤1.5	1.650	<0.263	<0.263	<0.263	0.474
Nitrate (NO3) as N	mg/l	<10	≤11	<0.194	0.261	0.202	0.242	0.368
Nitrite (NO2) as N	mg/l	-	≤0.9	<0.065	<0.065	<0.065	<0.065	<0.065
Ammonium (NH4) as N	mg/l	-	≤1.5	1.180	0.291	0.057	0.544	0.078



Parameters	Units	Guidelines		Sampled Boreholes				
		WUL	SANS 241	DK BH TSF S	DK BH TSF D	DKRWDN S	DKWRD S	KL BH
Aluminium (Al)	mg/l	<0.5	≤0.3	0.074	0.084	0.010	0.016	<0.002
Iron (Fe)	mg/l	<3	≤2	0.090	<0.004	0.071	<0.004	<0.004
Manganese (Mn)	mg/l	<0.5	≤0.4	7.400	44.800	2.320	0.076	0.021
Chromium (Cr)	mg/l	-	≤0.05	<0.003	<0.003	<0.003	<0.003	<0.003
Copper (Cu)	mg/l	-	≤2	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium (Cd)	mg/l	-	≤0.003	<0.002	0.002	<0.002	<0.002	<0.002
Lead (Pb)	mg/l	-	≤0.01	<0.004	<0.004	<0.004	<0.004	<0.004
Nickel (Ni)	mg/l	-	≤0.07	<0.002	0.002	0.010	<0.002	<0.002
Cobalt (Co)	mg/l	-	-	0.020	<0.003	0.017	<0.003	<0.003
Zinc (Zn)	mg/l	-	≤5	0.003	0.009	<0.002	<0.002	<0.002
Dissolved Uranium (U)	mg/l	<0.03	≤0.03	<0.015	<0.015	<0.015	<0.015	<0.015
Free Cyanide (CN)	mg/l	-	≤0.2	<0.008	<0.008	<0.008	<0.008	<0.008
Cyanide WAD	mg/l	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
Total Cyanide (CN)	mg/l	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Total coliform	CFU/100ml	-	≤10	102 000	190	0	18	4



Parameters	Units	Guidelines		Sampled Boreholes				
		WUL	SANS 241	DK BH TSF S	DK BH TSF D	DKRWDN S	DKWRD S	KL BH
E.coli	CFU/100ml	-	0	0	0	0	0	0

Table 25: Groundwater quality in catchment C23J (Kusasalethu TSF)

Parameters	Units	Guidelines		Sampled Boreholes							
		WUL	SANS 241	MBH14	MBH15	MBH16	MBH17	BH6	BH8 (Deep)	BH8 (Shallow)	BH9
pH @ 25°C	pH	5-9.7	≥5 to ≤9.7	6.83	7.23	7.30	5.32	5.26	6.47	7.82	5.62
Electrical conductivity (EC) @ 25°C	mS/m	<200	≤170	134	123	244	70	120	308	214	297
Total Dissolved solids @ 180°C	mg/l	<1200	≤1200	974	1 038	2 230	642	908	2 672	1 854	2 286
Turbidity	NTU	-	≤5	35.40	7.84	4.52	1.00	0.96	2.95	0.32	3.86
Total Alkalinity	mg $CaCO_3$/l	-	-	103	73	53	30	8	77	125	26
Calcium (Ca)	mg/l	<200	-	157.00	175.00	286.00	40.20	110.00	425.00	269.00	188.00
Magnesium (Mg)	mg/l	<100	-	30.70	47.70	150.00	56.00	11.40	236.00	157.00	75.30
Sodium (Na)	mg/l	<200	≤200	108.00	31.40	122.00	22.20	137.00	83.10	55.60	359.00
Potassium (K)	mg/l	-	-	9.79	13.60	7.67	3.26	22.10	8.37	8.91	12.90



Parameters	Units	Guidelines		Sampled Boreholes							
		WUL	SANS 241	MBH14	MBH15	MBH16	MBH17	BH6	BH8 (Deep)	BH8 (Shallow)	BH9
Chloride (Cl)	mg/l	<300	≤300	112	99	211	14	137	314	188	292
Sulphate (SO_4)	mg/l	<600	≤500	447	470	1 152	303	335	1 491	888	1 091
Fluoride (F)	mg/l	<1	≤1.5	<0.263	<0.263	<0.263	<0.263	<0.263	<0.263	0.593	0.367
Nitrate (NO_3) as N	mg/l	<10	≤11	0.391	1.570	1.930	3.940	14.400	0.515	0.657	<0.194
Nitrite (NO_2) as N	mg/l	-	≤0.9	<0.065	<0.065	<0.065	2.980	<0.065	<0.065	<0.065	<0.065
Ammonium (NH_4) as N	mg/l	-	≤1.5	0.560	0.056	0.063	6.390	0.254	0.100	0.065	17.300
Aluminium (Al)	mg/l	<0.5	≤0.3	0.026	0.028	0.030	0.309	0.478	0.062	0.042	0.082
Iron (Fe)	mg/l	<3	≤2	0.183	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Manganese (Mn)	mg/l	<0.5	≤0.4	1.600	0.069	3.320	1.160	0.266	0.101	0.091	42.600
Chromium (Cr)	mg/l	-	≤0.05	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Copper (Cu)	mg/l	-	≤2	<0.002	<0.002	<0.002	0.013	<0.002	<0.002	<0.002	<0.002
Cadmium (Cd)	mg/l	-	≤0.003	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002
Lead (Pb)	mg/l	-	≤0.01	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Nickel (Ni)	mg/l	-	≤0.07	<0.002	<0.002	0.064	0.192	0.008	0.005	<0.002	0.050
Cobalt (Co)	mg/l	-	-	0.016	<0.003	0.061	0.093	0.072	0.106	0.058	0.530

Parameters	Units	Guidelines		Sampled Boreholes							
		WUL	SANS 241	MBH14	MBH15	MBH16	MBH17	BH6	BH8 (Deep)	BH8 (Shallow)	BH9
Zinc (Zn)	mg/l	-	≤5	<0.002	<0.002	0.016	0.295	0.015	0.007	0.006	0.130
Dissolved Uranium (U)	mg/l	<0.03	≤0.03	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Free Cyanide (CN)	mg/l	-	≤0.2	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Cyanide WAD	mg/l	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Cyanide (CN)	mg/l	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total coliform	CFU/100ml	-	≤10	720	630	99	1	6	300	107	0
E.coli	CFU/100ml	-	0	240	200	11	0	0	10	0	0

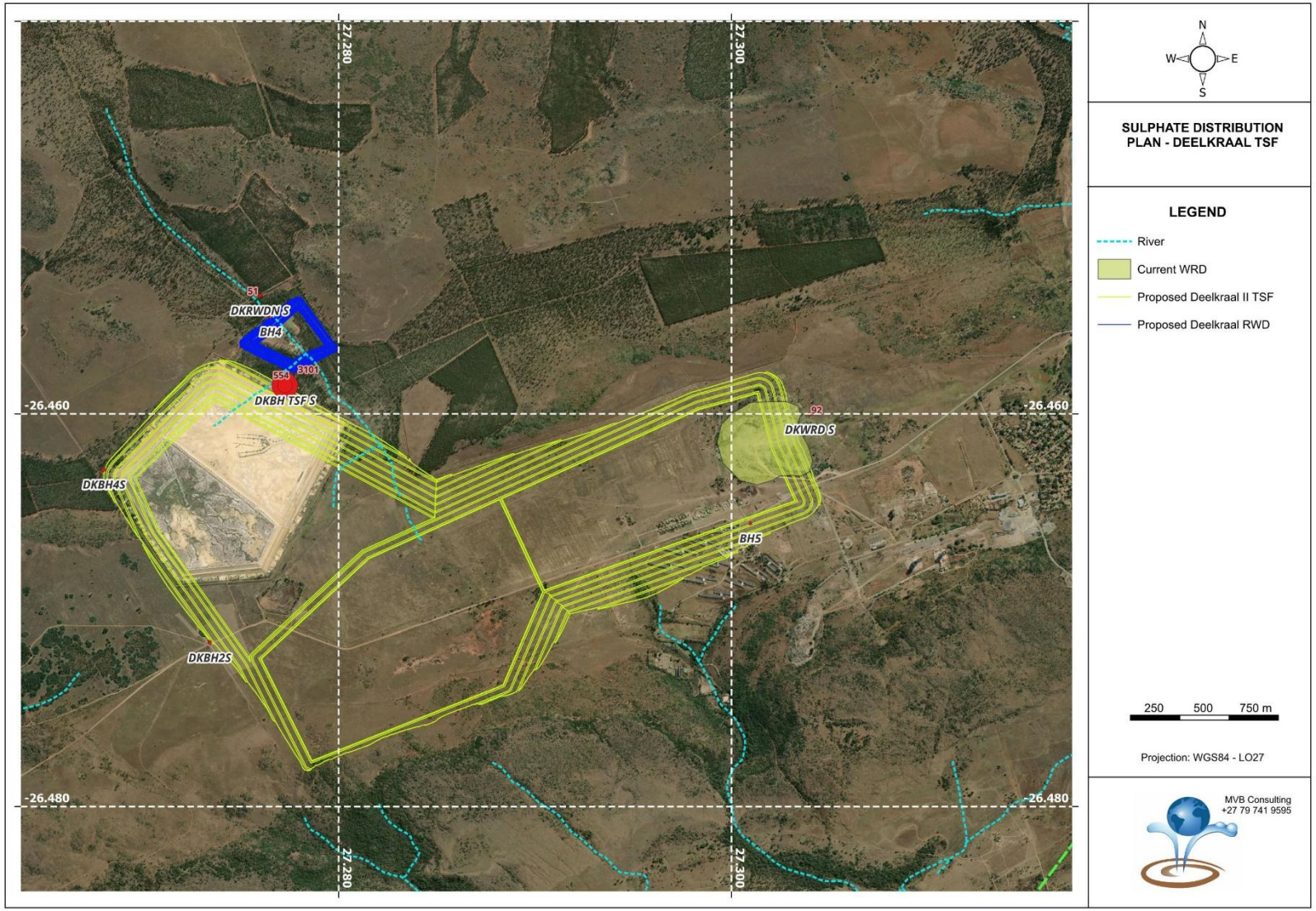


Figure 36: Sulphate concentration distribution in the Deelkraal TSF boreholes



Figure 37: Sulphate concentration distribution in the Kusasalethu TSF boreholes

2.11.7 OVERALL SITE HYDROGEOLOGY

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Weathered and fractured rock aquifer in the Transvaal Formations.
- Dolomitic and Karst Aquifers.

Although the dolomite aquifer is the most prominent aquifer in the region, it does not play any role in the activities at the Deelkraal and Kusasalethu TSF's. The dolomite is ±100 - 400m below surface at the two TSF sites. Evidence has shown that there is no connectivity between the weathered / fractured aquifer and the underlying dolomite aquifer. Even in compartments where the dolomite aquifer is dewatered the groundwater levels in the weathered / fractured aquifer remains unaffected.

Groundwater occurs in the near-surface geology in the weathered and fractured sedimentary deposits (quartzite and shale) of the Transvaal strata. The lava of the Hekpoort Formation has similar weathering characteristics to that of the shale and is therefore deemed as the same aquifer. These formations are not considered to contain economic and sustainable aquifers, but localised high yielding boreholes may, however, exist where significant fractures are intersected.

Groundwater recharge in the fractured aquifer is estimated at 22 mm / annum with water occurring in the shallow weathered zone and water bearing fractures only. This is equal to approximately 3.7% of mean annual precipitation. The average rainfall in the area is approximately 600 mm / annum.

In most geological terrains, the groundwater mimics the topography and at the tailings facilities there is a good correlation between the topography and the groundwater level, which suggests that groundwater flow will follow the topographical gradient. The groundwater flow at the Deelkraal TSF is to the north and at the Kusasalethu TSF it is to the south-west and south-east.

There are some private groundwater users in the vicinity of the Kusasalethu TSF, but the mine has included these boreholes in their monitoring programme. Aquatico Scientific (Pty) Ltd routinely monitors the groundwater quality in the mine monitoring boreholes at Kusasalethu and Deelkraal TSF's. The latest available data (September 2025) was made available and is used to assess the current impacts from the TSF's.

The following is concluded in terms of the groundwater quality at the Deelkraal TSF:

- The general physical water quality of the C23E (Deelkraal TSF) groundwater monitoring localities can be described as neutral and alkaline (DKWRD S), non-saline (DKRWDN S, DKWRD S and KL BH), very saline (DK BH TSF S) to extremely saline (DK BH TSF D).
- None of the monitoring boreholes recorded dissolved U or CN (all analysed forms) concentrations above the detection limit. Exceeding variable concentrations (including values) were observed in terms of pH, Electrical conductivity, calcium, magnesium, sodium, Total Alkalinity, chloride, fluoride and sulphate were recorded at majority of the C23E boreholes.
- The biggest impact is directly to the north of the TSF, which corresponds with the groundwater flow direction. Very high sulphate concentration in borehole DK BH TSF D is indicative of seepage from the TSF.
- High bacterial counts in terms of E. coli and (or) Total coliforms were recorded at some of the groundwater localities.

The general physical water quality of the C23J (Kusasalethu TSF) groundwater monitoring localities of this section can be described as neutral to acidic (MBH17, BH6 & BH9), saline (MBH14, MBH17 & BH6), very saline (MBH15, MBH16, BH8 (Shallow) & BH9) and extremely saline (BH8 (Deep)). None of the monitored localities for this section recorded CN or dissolved U concentrations above detection limit. Exceeding SANS Electrical conductivity values and concentrations of calcium, magnesium, sodium, chloride and sulphate were detected at all the sampling localities.

2.12 AIR QUALITY

The information in this section was provided by Airshed Planning Professionals (Air Quality Specialist). The wind field is dominated by winds from the northerly sector. The strongest winds (>6 m/s) occurred mostly from the north-northeasterly sector. Calm conditions occurred 3.5% of the time, with the average wind speed over the period of 3.63 m/s. Both daytime and night-time show dominant northerly wind fields, with calm conditions 4.4% during the day, and 2.52% during the night (Figure 38 and Figure 39).

Dust fallout sampling has been undertaken around the Kusasalethu operations since January 2019 by Aquatico Scientific and includes a network comprising of 7 single Dustfall Monitoring Units (DMU) in accordance with ASTM D1739 (1970). Five (5) of these DMUs are screened against the NDCR non-residential limit of 1 200 mg/m²/day, with the remaining two (2) units regarded as residential (screened against the NDCR residential limit of 600 mg/m²/day).Existing Sources of pollution

The current air quality in the study area is mostly influenced by mining, deposition and reclamation activities at Deelkraal, Kusasalethu and Savuka and other companies' mining operations, as well as farming activities, domestic fires, vehicle exhaust emissions and dust entrained by vehicles. These emission sources vary from activities that generate relatively course airborne particulates (such as farmland preparation, dust from paved and unpaved roads, and the mine sites) to fine PM such as that emitted by vehicle exhausts, diesel power generators and processing operations.

Domestic households are known to have the potential to be one the most significant sources that contribute to poor air quality within residential areas. Individual households are low volume emitters, but their cumulative impact is significant. It is likely that households within the local communities or settlements utilize coal, paraffin and/or wood for cooking and/or space heating (mainly during winter) purposes. Pollutants arising from the combustion of wood include respirable particulates, CO and SO2 with trace amounts of polycyclic aromatic hydrocarbons (PAHs), in particular benzo(a)pyrene and formaldehyde. Particulate emissions from wood burning have been found to contain about 50% elemental carbon and about 50% condensed hydrocarbons.

Biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity, crop-residue burning and wildfires (locally known as veld fires) may represent significant sources of combustion-related emissions. The frequency of wildfires in the grasslands varies between annual and triennial. Biomass burning is an incomplete combustion process (Cachier, 1992), with carbon monoxide, methane and nitrogen dioxide gases being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds (Held, et al., 1996). The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content.

Emissions from unpaved roads constitute a major source of emissions to the atmosphere in the South African context. When a vehicle travels on an unpaved road the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads vary in relation to the vehicle traffic and the silt loading on the roads. Unpaved roads in the region are mainly haul and access roads. Emissions from paved roads are significantly less than those originating from unpaved roads, however they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the re-suspension of loose material on the road surface.

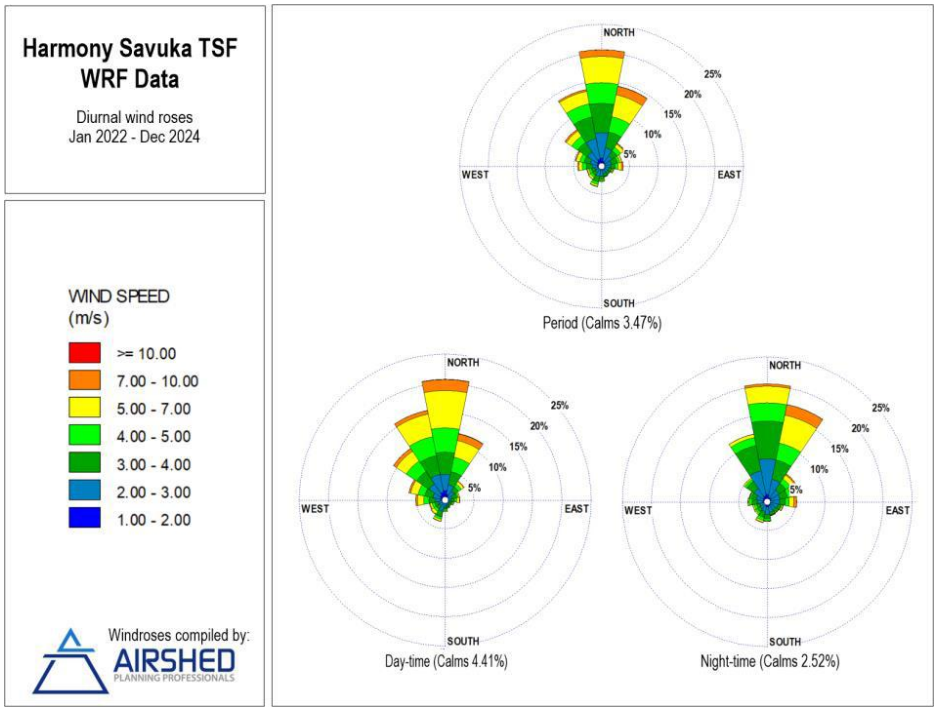


Figure 38: Period, day- and night-time wind roses (WRF data, January 2022 to December 2024)).

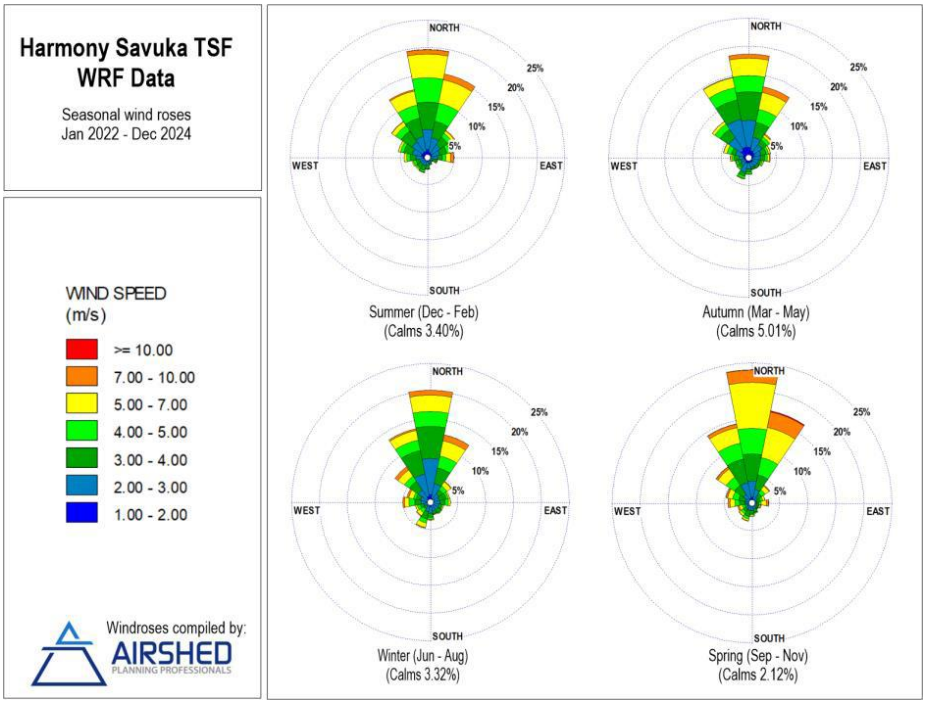


Figure 39: Seasonal wind roses (WRF data, January 2022 to December 2024).

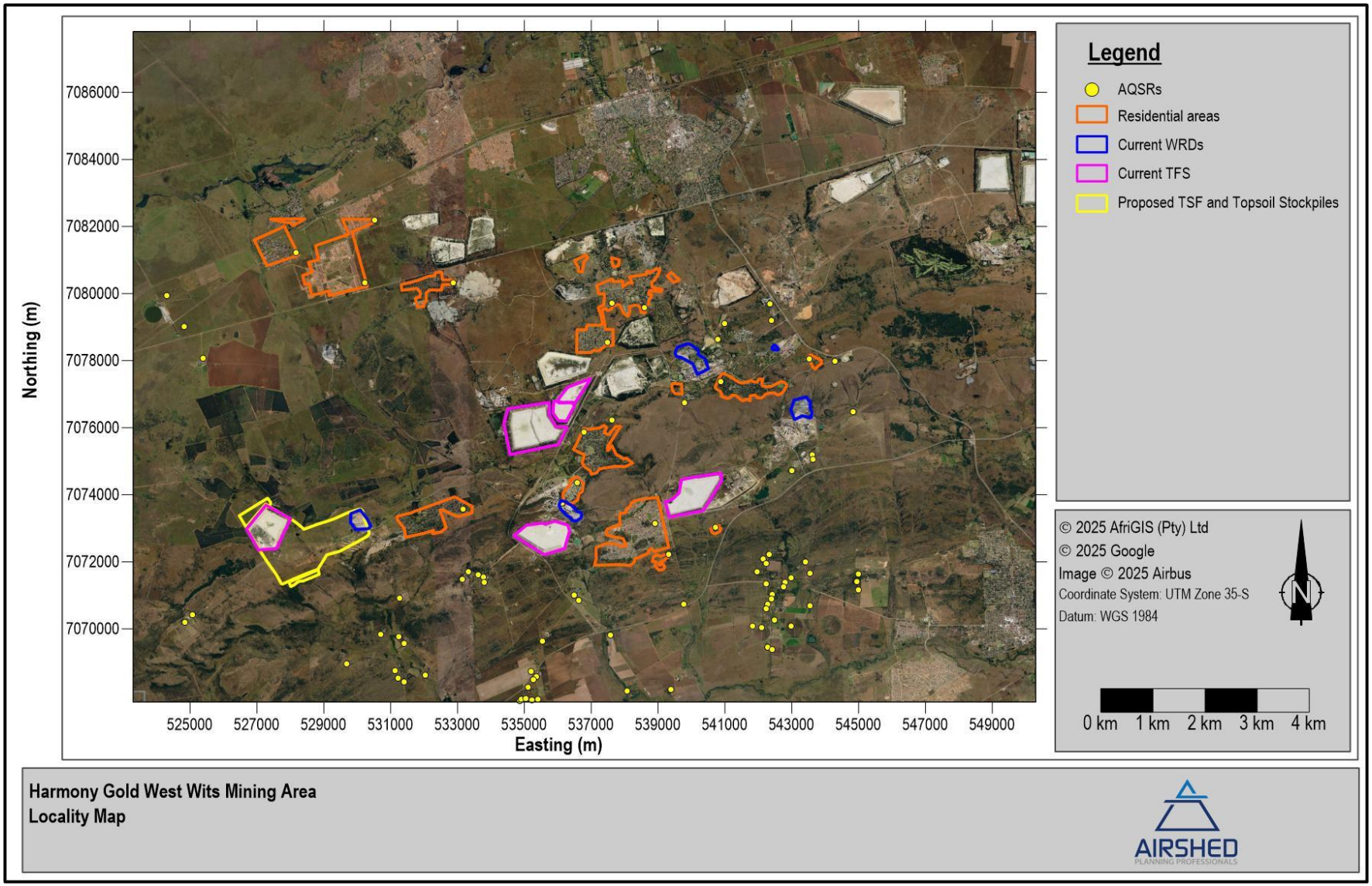


Figure 40: Location of sensitive receptors relative to the Project Area of Influence.

2.13 TRAFFIC

A review of historical traffic volumes within the study area was undertaken using data obtained from the SANRAL Yearbook (2019 & 2023) for national roads and the Gauteng Provincial Department of Roads and Transport Road Asset Management System (GPDRTRAMS, 2025) for provincial roads.

The adjoining road network experiences Average Daily Traffic (ADT) volumes ranging between 992 to 11103 vehicles per day. Of this, 269 to 500 vehicles per day comprise Average Daily Truck Traffic (ADTT), suggesting that heavy vehicles constitute a notable share of total traffic, with potential implications for pavement loading and road performance.

Based on the available ADT data, generally, peak hour traffic volumes constitute approximately 13% of the Average Daily Traffic (ADT) volumes. Accordingly, for the study area, the expected peak hour traffic volumes have been estimated based on the available ADT data, applying a peak hour factor of 13%. This approach provides a practical basis for assessing traffic conditions during the most critical operating period of the road network, typically corresponding to the morning or afternoon peaks. Figure 41 shows the estimated peak hour link volumes within the study area (white numbers). The estimated peak hour volumes are used to support the evaluation of intersection performance, level of service, and lane capacity requirements within the study area. Given the relatively low peak hour volumes observed, the base year hourly link volumes are not expected to be sufficient to justify the need for a roadway cross-section with substantially higher capacity than the existing available capacity.

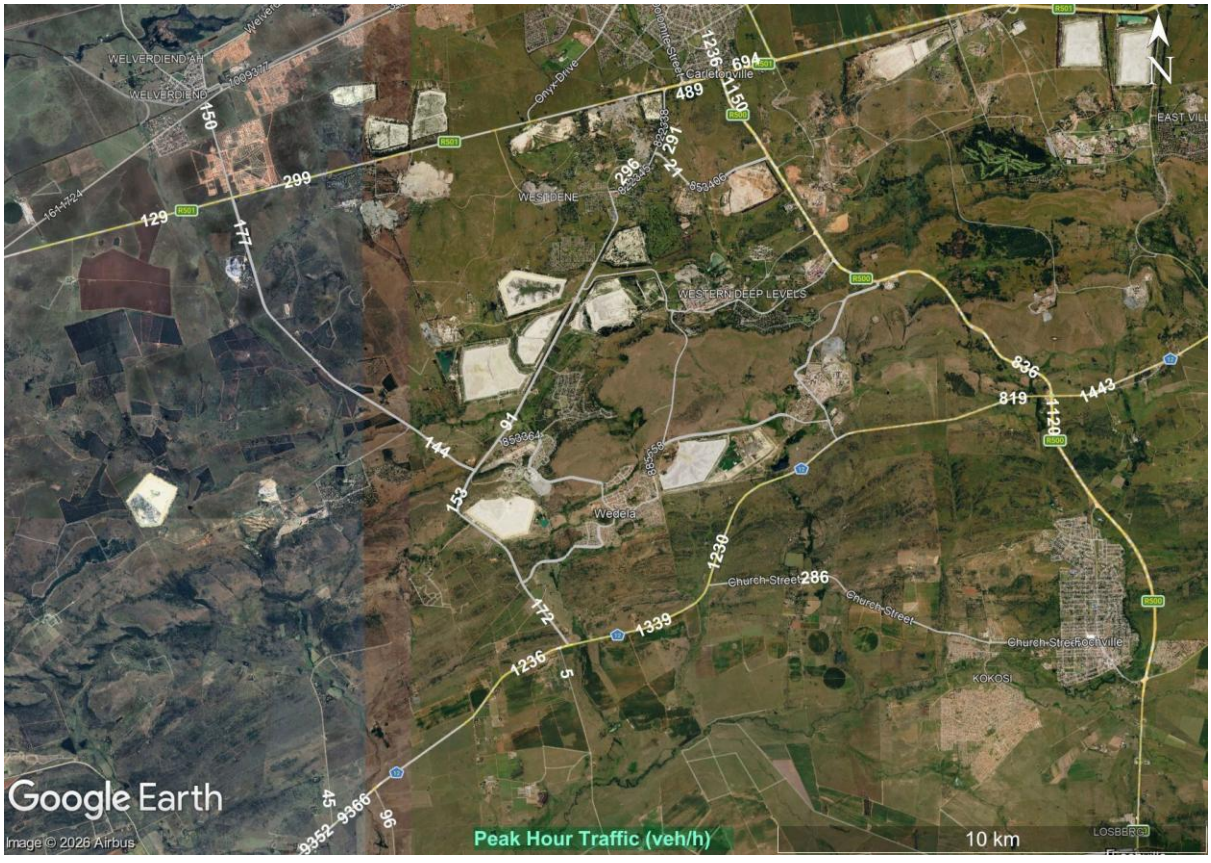


Figure 41: Peak hour traffic volumes (vehicles per hour)

2.14 VISUAL RECEPTORS AND LANDSCAPE CHARACTER

The study area comprises a combination of landscape character types including open grassland with some pans, agricultural lands, urbanisation and settlements, and mining and associated infrastructure. The following Landscape Character Areas (LCAs) were identified:

- The area of east / west aligned ridgelines and valleys within which the proposed project is located that includes the following landscape characteristic;
    - Valley slopes and ridgelines that are steep relative to areas directly to the north and south;\
    - A mix of alien trees including plantations within indigenous grassland areas;
    - Mining areas including infrastructure, waste and extraction sites; and
    - Formal housing areas that are largely associated with mining operations.
- The area to the north of the ridgelines that includes the following landscape characteristics;
    - Relatively flat topography;
    - Areas of housing development that are largely high density housing and medium rise blocks that appear relatively new and under development and
    - Areas of commercial cultivation and grazing within a matrix of natural grassland and stands of alien trees.
- The area to the south of the east / west aligned ridgelines and valleys that includes the following landscape characteristics;
    - Relatively flat topography;
    - Residential settlement largely in the form of individual homesteads; and
    - Areas of commercial cultivation and grazing within a matrix of natural grassland and stands of alien trees.

There is only one protected area, the Boskopdam Nature Reserve that is located approximately 16km west of the proposed project. The assessment indicates that whilst a small upper section of the Deelkraal II TSF may be visible, it is unlikely to be visually discernible from adjacent ridgelines and hillsides.

Deelkraal, Elandsridge and Wedelia are small mining settlement that is located within the area of ridgelines and valleys and within 1km of the proposed Deelkraal II TSF. Elandsridge is located in the vicinity of proposed pipeline and overhead power line routes and is approximately 6.2km from the proposed Deelkraal TSF;. The Boskop Dam Nature Reserve that is located approximately 16km to the west of the proposed project. A Passive Recreation Area immediately north of Deelkraal.

In terms of linear receptor, the R501 which is the main road running through the area to the north of the proposed project. This road connects Carletonville to the north-east with Potchesfstroom to the south-west; and the N12 which runs through the area to the south of the proposed project. This road connects Potchesftroom to the south-west with Soweto and the greater Johannesburg area to the east. Minor roads run through the area of ridgelines and valleys within which the proposed project is located. These roads are largely used by local people and for mine access

2.15 SOCIO-ECONOMIC

The socio-economic baseline conditions relevant to the Project area was provided by Equispectives (Social Specialist). The baseline socio-economic information was updated in 2022 through the 2022 South African Census (https://census.statssa.gov.za/#/province/7/2). The Draft Integrated Development Plan (IDP) for Merafong City 2025-26 best describes the socio-economic conditions for the Municipality (https://merafong.gov.za/wp-content/uploads/2025/04/Draft-IDP-Document-March-2025-2026.pdf).

2.15.1 MUNICIPAL PROFILE

According to the Draft Integrated Development Plan (IDP) for Merafong City 2025-26, Merafong City Local Municipality (MCLM) is a Category B municipality with an Executive Mayor Governance system. A Category B municipality, also known as a local municipality, is a type of local government in South Africa that shares executive and legislative authority with a Category C (district) municipality. These municipalities are the primary providers of local services, such as refuse removal, sewage, and water supply, operating within a broader district municipality framework for more regional functions like bulk water infrastructure and integrated development planning.

The Speaker is the Chairperson of Council and is responsible for overseeing the functioning of Council and its committees. The office of the Speaker is further responsible for the establishment and functioning of ward committees. The Chief Whip is responsible for ensuring compliance to the code of conduct by Councillors. MCLM covers an area of 1631.7km² and it comprises of twenty-eight (28) wards in terms of Section 18 (3) of the local government: Municipal Structures Act, 1998 (Act 117 of 1998) which constitutes 28 Ward Councillors and 24 Proportional Representative Councillors. MCLM is situated in the South-western part of Gauteng Province and form a part of West Rand District Municipality which consists of four local municipalities namely: Mogale City, Rand West Municipality and Merafong City. MCLM incorporates the following areas:

- Carletonville;
- Khutsong;
- Fochville;
- Kokosi;
- Greenspark;
- Welverdiend;
- Wedela;
- Blybank; and
- Mining Towns.

2.15.2 DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

Population statistics are normally collected by way of a Census, however because Censuses are usually a huge logistical exercise, many Countries conduct a Census once every 5 to ten years. Between Censuses administrative data is collected by various agencies about population, events such as births, deaths and cross-border migration and these agencies are allowed to produce and use this data. It has been about 12 years since the 2011 Census has taken place, therefore the available data has become old and unreliable. In 2016 Statistics South Africa conducted a Community Survey to supplement the 2011 Census and the municipality has in the past used those figures complemented by data released by other sources such as Quantec Survey of 2017. The most recent Census was undertaken in 2022 and some of the results have been released by Statistics South Africa.

2.15.2.1 **POPULATION DYNAMICS**

The West Rand population increased by 21,6% from 821 191 in 2011 to 998 466 in 2022 whereas Merafong population increased by 14,2% from 2011 to 2022 rising from 197 520 to 225 476. The West Rand is the least populated District in Gauteng with 0,9 million (988 466) people while Merafong City is the least populated

Municipality in West Rand with 225 476 people. The research also shows that in most Wards, the majority of the population belongs to the Black population group. In Ward 12 more than half of the population belonged to the White population group, while in Ward 14 just over a third of the population belonged to the White population group. Ward 12 includes Deelkraal as well as Welverdiend (which is located outside the 5 km radius). Ward 14 includes West Wits Village, a portion of Fochville, the Numba Wani Residence and the Mohaleshoek Informal Settlement. At 85,5% the Black African population group constitutes the largest proportion of West Rand's population, followed by White (10,3%) and Coloured (2,8%). At 89,4% the Black African population group constitutes the largest proportion of Merafong's population, followed by White (8,8%) and Coloured (1,3%). Refer to Figure 42 for the population by race dynamics.

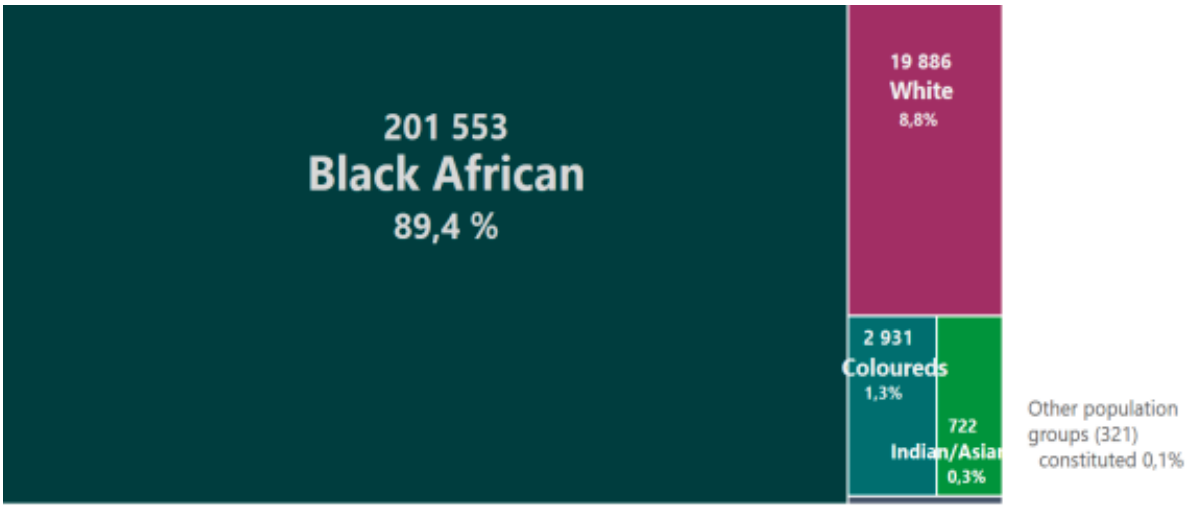


Figure 42: Merafong population groups (Statssa, Census 2022)

2.15.2.2 HOUSING DYNAMICS

Gauteng Households increased from 2,1 million in 1996 to 5,3 million in 2022. There were about 357 thousand households in West Rand 2022 with 77 599 thousand households located within Merafong City in 2022. The number of households in Merafong City increased by 16.5% from 66 624 in 2011. West Rand's average household size slightly decreased from 3,1 in 2011 to 2,8 in 2022 while the average household size in Merafong City also decreased slightly by 0.1 between 2011 and 2022. Households that resided in formal dwellings increased by 13,6 percentage points from 74,9% in 1996 to 88,5% in 2022 in Gauteng. There were more households that resided in formal dwellings in Merafong City in 2022 as compared to other municipalities in West Rand. Households that resided in formal dwellings increased from 60,4% in 1996 to 91,6% in 2022 in Merafong City.

2.15.2.3 SOCIO-ECONOMIC CONDITIONS

Gauteng is the economic hub of the country, with over 35% of the economic activity taking place in the province. However, Gauteng continues to bear the brunt of high poverty, inequality, and unemployment levels. At the centre of the development of the Growing Gauteng Together 2030 (GGT2030) strategy, which is the provincial expression of the National Development Plan (NDP), the provincial government aims to address the challenges noted above. The GGT2030 goal is to reduce poverty to about 16 per cent of the total population by 2030 from 25.3 per cent in 2019. The plan also aims to reduce income inequality levels (as measured by the Gini coefficient) to 62 per cent in Gauteng. Since the dawn of democracy, significant progress has been made to reduce the high levels of poverty and inequality. However, the deterioration in economic performance in recent years due to domestic and external factors has regressed some of the progress made, with levels of inequality being more prevalent within population groups.

Table 26 shows different measures of poverty for the West Rand district and the local regions. In 2020, over 50 per cent of the districts were living below the UBPL. With economic activity in negative territory in the district before the pandemic and the unemployment rate at its highest level, these did not favour the initiatives targeted

at reducing poverty in the district. The Upper-Bound Poverty Line (UBPL) was the highest in Rand West City at 54.2% in 2020, followed by Merafong City at 53.1%. Refer to Table 26 for the poverty and inequality trends.

Table 26: Selected Poverty Indicators (source: Draft IDP Merafong City 2025-26)

Regions	2010	2012	2014	2016	2018	2020
Food Poverty Line (ZAR 624)						
West Rand	16,7%	14,8%	16,0%	19,2%	21,0%	24,3%
Mogale City	16,9%	14,6%	15,7%	18,7%	20,6%	24,0%
Merafong City	15,0%	14,0%	15,2%	18,6%	20,3%	23,2%
Rand West City	17,6%	15,6%	16,9%	20,2%	22,0%	25,3%
Lower Poverty Line (ZAR 890)						
West Rand	28,6%	26,4%	28,1%	31,5%	33,9%	37,6%
Mogale City	28,8%	26,1%	27,6%	30,7%	33,1%	36,9%
Merafong City	26,4%	25,3%	27,1%	31,1%	33,5%	36,9%
Rand West City	30,0%	27,6%	29,4%	32,9%	35,2%	38,9%
Upper Poverty Line (ZAR1 335)						
West Rand	45,0%	42,7%	44,0%	46,6%	49,0%	52,7%
Mogale City	44,5%	41,7%	42,9%	45,2%	47,6%	51,4%
Merafong City	43,8%	42,7%	44,0%	47,2%	49,5%	53,1%
Rand West City	46,7%	44,1%	45,5%	48,3%	50,6%	54,2%
Poverty Gap Rate						
West Rand	31,4%	30,4%	30,4%	30,7%	31,1%	31,8%
Mogale City	31,4%	30,4%	30,5%	30,8%	31,1%	31,8%
Merafong City	31,5%	30,4%	30,5%	30,9%	31,2%	32,0%
Rand West City	31,2%	30,2%	30,3%	30,6%	31,0%	31,7%

Based on the income inequality as measured by the Gini coefficient for the West Rand district and its local regions, over the period of 2012 to 2020, not much change or movement happened in all the regions, as the increases in later years were marginal. However, the numbers have maintained a level just above 0.6. Much of the inequality is in Mogale City, the region with relatively high activity in the whole district. The Gini coefficient in the region increased from 0.642 in 2012 to 0.644 in 2020.

The better-than-expected recovery in the first half of 2021 improved business activity in municipalities, amid a strong rebound in global demand and higher commodity prices. Going forward, the recovery in economic activity is dependent on various factors, including effective vaccination rollout and sustained provision of energy to all the sectors of the economy. Similarly, in the West Rand, like other regions, economic output has declined for several years, with negative growth rates going back to the start of the review period. The decline in the mining activity of the district over the years has resulted in reduced total output. Mining accounted for 31% of the West Rand's economic output in 1996; it shrunk to an estimated 19.5% by 2021. However, the sector still accounts for the second highest share of economic activity in the region (refer to Figure 43).

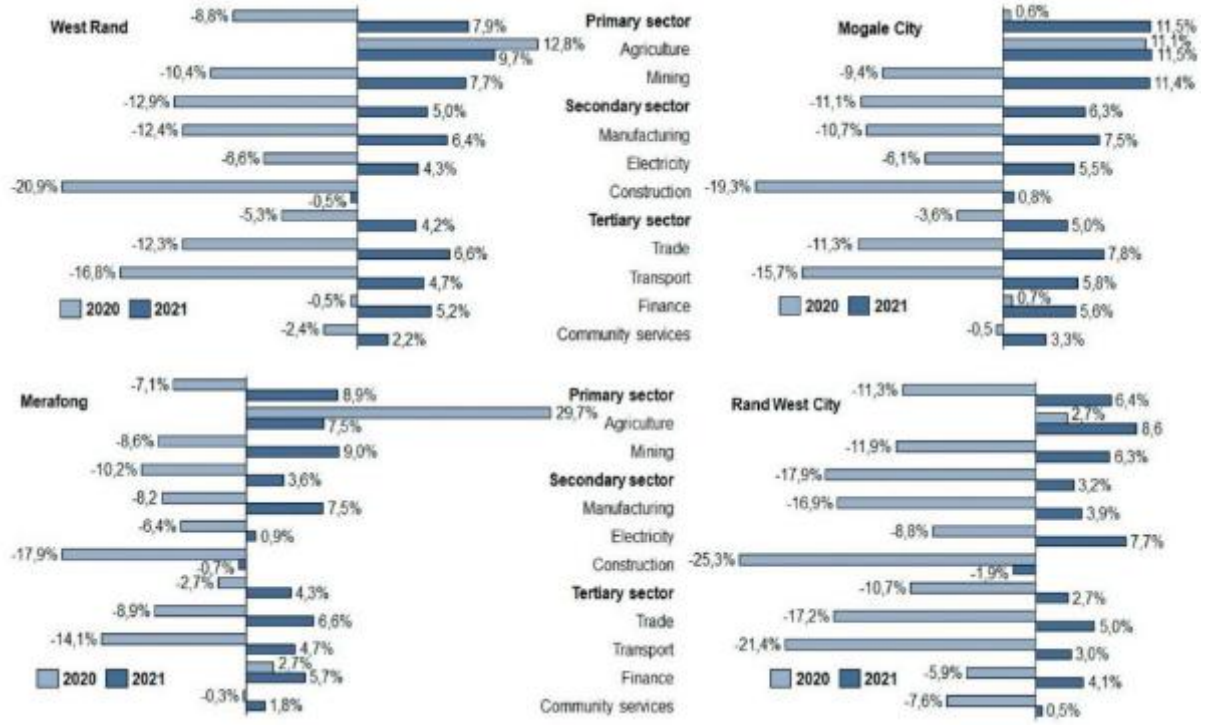


Figure 43: Sector Output Growth (IHS Markit, 2022; Draft IDP Merafong City 2025-26)

The district has also seen the highest contractions in the construction sector, recording a decline of 20.9 per cent in 2020 before a relative improvement however, still negative at 0.5 per cent. In Mogale City, construction decreased by 19.3 per cent, while it declined by 25.2 per cent in Rand West city and by 17.9 per cent in Merafong in the same period. The restriction of mobility of people and the halt of existing and planned projects affected the sector across regions. The agriculture sector has recorded growth for 2020 and is expected to record positive growth for 2021. Mining activity in the district region grew by 7.7 per cent, following a decrease of 10.4 per cent in 2020.

2.15.2.4 **SERVICE DELIVERY**

All Municipalities in West Rand had more than 90% of households having access to electricity for lighting in 2022. Merafong City had an increase from 82,8% in 2011 to 98,1% in 2022. West Rand District had the third highest (76,7%) proportion of households with access to piped water inside dwelling. Merafong City had the highest (81,9%) proportion of households with access to piped water inside the dwelling. While households using flush toilets only increased by 4,3 percentage points between 2011 and 2022 in Gauteng, households using flush toilets increased by 10 percentage points between 2011 and 2022 in West Rand. Households in Merafong City (94,1%) had the highest access to flush toilets than other municipalities. Approximately 84,3% of households in West Rand had their refuse removed by a local authority once a week. Refuse removal by local authority at least once a week increased from 77,7% in 1996 to 84,3% in 2022 in West Rand. Merafong City had the lowest percentage (81.9%) of refuse removal by local authority at least once a week as compared to other municipalities. Households with no access to internet declined by 40 percentage points, from 53,6% in 2011 to only 13,6% in 2022 in Gauteng Province.



2.15.2.5 SITE-SPECIFIC CONDITIONS (FIELDWORK FINDINGS)

Fieldwork in the project area revealed a receiving environment under significant social and economic stress, in which the legacy of mine decline, service-delivery failure, crime and tenure insecurity strongly shape how communities are likely to experience the project. The following site-specific conditions were recorded and form an important part of the social baseline.

Deelkraal Village

- Deelkraal Village is a self-contained former mine village with its own water and refuse arrangements, a clinic operating from a privately owned house, a club and a library; children attend school in Elandsrand, Fochville and Carletonville.
- The village has experienced a prolonged loss of electricity supply (reported as several months at the time of fieldwork) following the switching-off of power and the plundering and burning of the local power station and the theft of power-line towers. As a consequence, sewage can no longer be pumped, and the village has relied on water tankering over an extended period.
- The resident population includes a significant number of elderly and vulnerable people, including persons dependent on oxygen. Rentals are comparatively low, and a number of houses (reported as around 38) stand vacant and are subject to vandalism and cable theft.
- There is internal social tension associated with rent and service-payment disputes, and the village is subject to a court-supervised arrangement. Ownership and rental arrangements are contested (see the land-ownership dispute in the stakeholder analysis).
- Despite these pressures, residents described the village as relatively safe internally, with controlled (boom-gate) access and good inter-group relations, and noted aspirations to develop a retirement village and other facilities.
- Residents expressed specific concerns about dust from the proposed TSF, about construction and operational traffic passing through or near the village to reach the TSF, about the condition and maintenance of the private access road, and about the consequences of a potential TSF failure given that the local stream flows towards Potchefstroom.

Farms and smallholdings

- Farming in the area includes cattle and game; for some farms an on-farm dam and stream are the only water source for livestock, game and people, and these depend in part on runoff water associated with the mine.
- Landowners reported persistent theft (including the theft of Eskom infrastructure and the loss of livestock to theft and slaughter), and emphasised that during construction gates must be kept closed and fences kept intact to prevent livestock loss and straying.
- Open excavations and trenches pose a hazard to livestock, as does construction litter (for example plastic and safety tape) which animals may ingest.
- Residents reported seismic tremors and cracking of houses, variously attributed to mining-related seismicity and to dolomitic ground movement.

Informal occupiers and artisanal miners (‘zama-zamas’)

- A small settlement of informal occupiers, reported as a group of men, many said to be foreign nationals, is present in the area, with some having lived there since around 2009 and artisanal mining activity reported from around 2016. Occupants include cattle herders and artisanal miners; family members reportedly do not live on site.



- The occupiers keep livestock (a reported 200–400 cattle, together with goats, pigs and poultry) which graze in the area and are sold at auction, and they cultivate crops including maize, spinach, peppers and chillies. This is reportedly the only cattle kraal in the immediate area, and the occupiers indicated they do not know where they would graze their livestock if they could not remain.
- Occupants were reported to be largely illiterate and to have limited English, which has implications for the accessibility of engagement. Medicinal plants were observed in the area.
- Cultivation and a kraal were observed on the proposed TSF footprint. The occupiers are not present with formal legal authority; nonetheless, their presence raises livelihood, vulnerability and potential-displacement considerations that must be managed in line with international standards, irrespective of tenure status. While the occupiers may not have legal rights to the land, international human rights standards recognise that all persons are rights-holders, regardless of tenure status. As such, any impacts on their livelihoods, shelter, access to resources or well-being should be identified and managed in a manner consistent with good international industry practice.

Broader settlement conditions

Across the surrounding settlements, fieldwork and consultation recorded very high local unemployment, widespread dependence on social grants, deteriorating municipal services and roads (with some areas only accessible by four-wheel-drive vehicle), substance-abuse and crime problems (including drug dealing and stock theft), insecure tenure and the absence of title deeds for some occupiers, and a strong reluctance among some residents to relocate from mine-linked settlements that are bound up with severance arrangements and a sense of place. Mistrust of both the municipality and mining operators was a recurring theme, and the presence of artisanal mining and infrastructure theft is a pervasive feature of the operating environment. These conditions form the backdrop against which the project's social impacts will be experienced.

2.16 ENVIRONMENTAL RISK ASSESSMENT

2.16.1 IMPACT AND RISK IDENTIFICATION

An environmental risk assessment was undertaken to identify the impacts and risks associated with rehabilitation, decommissioning and closure, and to inform the most appropriate closure strategy. The assessment applies the significance methodology used in the operation's EIA / EMPr (consequence , extent, duration, intensity , combined with probability), so that closure risks are rated on a consistent, auditable basis and linked to the closure actions in Section 2.19.

2.16.2 SPECIALIST FINDINGS

The table below lists the specialist assessments undertaken for the proposed project, including the key findings specifically for the decommissioning, closure and rehabilitation phases.



Table 27: Summary of Specialists' findings.

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
Terrestrial Biodiversity Assessment	Vegetation and ecosystem status. The Project Area of Influence (PAOI) falls in the Savanna Biome, over Gauteng Shale Mountain Bushveld with marginal Andesite and Gold Reef Mountain Bushveld; parts were field-verified as Carletonville Dolomite Grassland. All ecosystem types are Least Concern but Poorly Protected. Conservation planning overlaps. CBA 2, ESA 1 and (marginally) ESA 2 of the Gauteng C-Plan v4 (2024); ESA and Important Areas of the West Rand Bioregional Plan; Class 1 and Class 2 Gauteng Ridges and the 200 m Class 1 ridge buffer; NPAES Priority Focus Areas; CR rivers and wetlands (SAIIAE); Class D Largely Modified FEPA rivers. The Mining and Biodiversity Guideline rates the PAOI as moderate to highest biodiversity importance (i.e. moderate to highest risk for mining). Flora. 86 indigenous species recorded. No flora SCC were recorded on site, but seven provincially protected species (Schedule 11, Transvaal Nature Conservation Ordinance 12 of 1983) were: Scadoxus puniceus, Gladiolus crassifolius, Protea caffra subsp. caffra, Cheilanthes hirta, C. involuta, C. viridis and Pellaea calomelanos. Three flora SCC , Khadia beswickii (VU), Cleome conrathii (NT) and Adromischus umbraticola (NT) , were confirmed within 500 m of the PAOI and have a high likelihood of occurrence in the rocky habitats. Alien invasive plants. 20 AIP species recorded, including 13 NEMBA Category 1b and 3 Category 2 species; an AIP Management Programme is a legal requirement under s.75 of NEMBA. Fauna. Eight mammal and 30 avifauna species recorded; one avifauna SCC observed (Elanus caeruleus, NT regionally). Crocidura maquassiensis (VU) has a high likelihood of occurrence in rocky habitat. No herpetofauna recorded. Site Ecological Importance (SEI). High , Rocky Gauteng Shale Mountain Bushveld (91.5 ha), Rocky Carletonville Dolomite Grassland (21.9 ha) and	Note: the significance tables (Tables 4-3 and 4-4) rate construction and operational phase impacts only. Although Section 4.1 states that impacts were assessed for the closure phase, no closure-phase ratings are given. The impacts below are those with a direct decommissioning, rehabilitation and closure consequence, with the specialist's ratings for the phase actually assessed. Permanent loss of habitat under the TSF footprint (irreversible). Destruction of non-resilient habitats (rocky outcrops) is the highest-rated terrestrial impact: pre-mitigation High−, post-mitigation Medium to high−, final significance −14.63 (High−) for the linear infrastructure. High SEI rocky habitat and Class 1 Ridge cannot be rehabilitated to a pre-mining state , offset mitigation may be required for high-impact activities. Habitat destruction, loss and fragmentation. Linear infrastructure, construction: pre High− → post Medium to high−; cumulative final −11.81 (Medium to high−). TSF, construction: Medium to low− throughout; final −6.75 (Medium to low−). Rehabilitation and landscaping of all structure footprints after construction is required, and rehabilitation of already-disturbed areas is to be made a priority. Clearing of vegetation leading to soil erosion and loss of topsoil. Construction (both linear infrastructure and TSF): pre Medium to high− → post Medium to low−; final −8.25 (Medium to low−). Requires a habitat rehabilitation and revegetation plan, retention and re-use of topsoil, and re-vegetation with indigenous species endemic to the vegetation type , a direct closure cost driver. Continuous stripping of topsoil leading to ongoing land degradation and erosion. TSF, operational: pre Medium to High → post Medium to low; final −7.59 (Medium to low−). Persists into

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	Wetlands & in-stream dams (101.3 ha). Medium , Carletonville Dolomite Grassland (103 ha). Low , Degraded Gauteng Shale Mountain Bushveld (171 ha), Degraded Carletonville Dolomite Grassland (248.9 ha), Severely Modified alien stands (120 ha) and artificial/off-stream dams, rock quarry and non-perennial drainage (110.3 ha). Very Low , Irreversibly Modified (365 ha). Receptor resilience. The High SEI rocky habitats and wetlands are rated Low resilience: unlikely to recover fully, with more than 15 years required to restore less than 50% of the original species composition and functionality. Degraded habitats will recover slowly (>10 years); Irreversibly Modified habitat is rated High resilience (5–10 years) but will not recover without intervention. Screening Tool verification. Terrestrial Biodiversity Theme "Very High", Animal Theme "High" and Plant Theme "Medium" were largely disputed; specialist-assigned sensitivities range from Very Low (Irreversibly Modified) to High (rocky habitats, wetlands). Specialist opinion. No fatal flaw. The project may be favourably considered provided all mitigation is implemented, subject to avoidance of High SEI rocky habitats and Class 1 Ridges (no-go) plus the 200 m buffer for high-impact development. Pipeline Corridor 1 (southern option) is preferred. Development within CBA 2, ESA 1 and the Gauteng Ridges remains at the discretion of the competent authority.	decommissioning until final landform stabilisation and revegetation are achieved. Environmental pollution from water / acid mine drainage runoff. TSF, operational: pre Medium to High → post Medium to low; final −5.06 (Medium to low−). Requires stormwater management, clean/dirty water separation, engineered cut-off berms and PCD containment; berms are to be removed or rehabilitated after construction unless required for ongoing operational control. Continued risk of soil and water contamination from fuel spills and hazardous materials. TSF, operational: pre Medium to High → post Low−; final −4.00 (Low−). Directly relevant to demolition and decommissioning of the plant upgrades, pump stations, pipelines and laydown areas, and to removal of contaminated soil/yard stone. Continued encroachment by alien and invasive plant species. Operational: pre Medium to High → post Low−; final −4.00 (linear) / −3.94 (TSF) (Low−). The AIP Management Plan must be maintained and updated annually, and follow-up rehabilitation and re-vegetation of bare areas continued , an ongoing post-closure maintenance liability. Ongoing loss and displacement of fauna. Operational, linear infrastructure: pre High → post Medium to high; final −10.13 (Medium to high−). Reduces on decommissioning as traffic and disturbance cease, but rehabilitation of servitudes and removal of barriers to faunal movement is required. Closure-phase obligations carried into the FRDCP. A habitat rehabilitation and revegetation plan; an alien and invasive plant management plan; removal of all construction materials and non-permanent structures from the PAOI; follow-up rehabilitation and re-vegetation of remaining denuded areas with local indigenous

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
		plants; protected-species relocation or destruction permits from the Gauteng Department of the Environment before any clearing; a wet-season (October–March) walkdown of High SEI areas prior to development; and ongoing compliance monitoring and adaptive management, which the specialist states is "essential to ensure the long-term persistence of biodiversity and ecosystem services".
Wetland Baseline and Impact Assessment	Delineation. Sixteen (16) hydrogeomorphic (HGM) units were delineated within the 500 m PAOI: eight (8) hillslope seeps, five (5) unchannelled valley-bottom wetlands and three (3) channelled valley-bottom wetlands, together with non-perennial drainage features, dams and artificial features. All identified wetlands intersect the proposed project site except HGM 9, HGM 13 and HGM 14. Catchment setting. Highveld Ecoregion, Vaal-Orange WMA, quaternary catchments C23E and C23J; land types Fb15 and Fb5. SAIIAE and NFEPA classify the affected wetlands and the Mooirivierloop tributaries as Critically Endangered and Not Protected. Present Ecological State (PES). E , Seriously Modified: HGM 1, 2, 3, 5, 6, 8, 11, 12, 14, 15 and 16. D , Largely Modified: HGM 4, 7, 9, 10 and 13. Drivers include mining infrastructure, berms, roads and artificial runoff, informal settlement drainage, grazing and trampling, historic excavation and infilling, and sediment-laden and potentially contaminated runoff. Ecological Importance and Sensitivity (EIS). All 16 HGM units rate "B , High". Ecosystem services (WET-EcoServices). Moderately-Low: HGM 2, 4 and 14. Moderate: HGM 1, 3, 5, 6, 9, 11, 12, 13, 15 and 16. Moderately-High: HGM 7, 8 and 10 (the better-functioning systems). REC / RMO. E/F , Improve (HGM 1, 2, 3, 5, 6, 8, 11, 12, 14, 15, 16) and C/D , Improve (HGM 4, 7, 9, 10, 13). The management objective for every wetland is to improve the current PES.	This assessment expressly rates the decommissioning phase, in both the DWS Risk Assessment Matrix (RAM) and the EIMS impact matrix. DWS RAM , decommissioning phase Decommissioning of the TSF where it intersects wetlands and drainage features (HGM 1–6). Wetland degradation; vegetation and habitat disturbance; erosion and sedimentation of wetlands; altered surface flow and wetland hydrology; polluted runoff and spill risk; dust and disturbance to wetland fauna , each rated 64, High (H) risk. Altered hydrology and geomorphology of non-perennial drainage , 48, Moderate (M). Decommissioning of pipelines intersecting wetlands (HGM 3, 7, 8, 11, 12). Wetland degradation; vegetation and habitat disturbance; erosion and sedimentation; altered drainage and hydrological connectivity; soil compaction and wetland buffer degradation , each 32, Moderate. Hydrocarbon and demolition-related contamination risk , 24, Low. Decommissioning of powerlines intersecting wetlands (HGM 7, 8, 10). Wetland degradation; vegetation and habitat disturbance; disturbance to wetland fauna and soil compaction , 32, Moderate. Erosion and sedimentation; altered local drainage patterns; pollution from fuels, oils and demolition activities , 24, Low.

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	Buffers. Wetlands 50 m pre-mitigation, 25 m post-mitigation; non-perennial watershed features 30 m / 15 m. GDARDE requires a minimum 50 m rural buffer, so any relaxation to the specialist-assigned 25 m must be approved by the competent authority. Both the NWA (GN 4167 of 2023, s.21(c) and (i)) and NEMA regulated areas apply. Screening Tool verification. "Very High" aquatic biodiversity sensitivity validated for wetlands and in-stream dams (specialist: High/Very High). Disputed for drainage features and freshwater buffers, both assigned Moderate; artificial features, off-stream dams and the rock quarry validated as Low. Key layout conflict. The current TSF footprint would result in the complete loss of HGM 1, HGM 2 and HGM 4, substantial loss of HGM 3, HGM 5 and HGM 6, and loss of sections of non-perennial drainage. The TSF component carries a High residual DWS risk rating (64) where it directly overlaps wetland habitat, whereas linear infrastructure and plant components reduce to Low–Moderate after mitigation. Specialist opinion. No fatal flaw. The project is supportable from a freshwater perspective on a strictly conditional basis, subject to rigorous implementation of the mitigation, rehabilitation and monitoring measures. Offsetting is to be considered only as a measure of last resort for unavoidable residual wetland loss.	Decommissioning within 500 m of wetlands / 100 m of drainage (all HGM 1–16). TSF 24 (Low); pipelines and powerlines 11.2 (Low); altered hydrology and geomorphology of non-perennial drainage 18 and 8.4 respectively (Low). EIMS impact matrix , decommissioning phase Wet12 , Degradation of wetland vegetation and proliferation of alien and invasive species. Pre-mitigation −6.75 (Medium to low−) → post-mitigation −3.5 (Low−) → final −4.38 (Medium to low−). Wet13 , Disruption of wetland soil profile, hydrological regime and increased sediment loads. Pre-mitigation −6.75 (Medium to low−) → post-mitigation −3.5 (Low−) → final −4.38 (Medium to low−). Wet07 / Wet11 , Degradation and demolition of wetlands due to the TSF and intersecting infrastructure. Construction and operation: pre-mitigation −18.75 (High−) → post-mitigation −13 (Medium to high−) → final −19.50 (High−). This is the only residual High impact in the study and represents permanent wetland loss that carries directly into the closure liability. Closure and rehabilitation obligations Decommissioning and closure method statement. Removal of temporary infrastructure; decompaction of affected areas; re-establishment of drainage patterns; stabilisation of final landforms; rehabilitation of redundant roads and service corridors; and removal of all waste and contaminated material. Targeted wetland rehabilitation. Rehabilitation of the residual and hydrologically connected systems , particularly the remaining portions of HGM 3, HGM 5 and HGM 6 together with associated drainage and buffer areas , including removal of redundant fill, berms and flow obstructions; regrading and stabilisation; reinstatement of diffuse surface flow and shallow subsurface

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
		connectivity; sequential replacement of topsoil and wetland-related soils; revegetation with locally indigenous wetland and riparian species; and alien invasive plant control. Progressive rehabilitation. To be implemented as areas become available rather than deferred to closure, with no untreated disturbed area left beyond one rainy season where access permits. Post-closure monitoring and maintenance. Weekly during decommissioning and quarterly post-closure until sign-off, continuing until closure criteria for erosion control, pollution prevention and vegetation establishment are met. Monitoring covers erosion, vegetation establishment, hydrological response and rehabilitation performance, with adaptive intervention where required, overseen by a suitably qualified ECO with freshwater specialist input. Water use authorisation. All crossings, and wetlands that will be directly impacted and/or lost, must be addressed through the applicable water use authorisation process; the RAM must be reviewed and updated if the layout is amended.
Hydrogeological (Geohydrological) Assessment	Aquifer systems. Three aquifers occur: (i) a shallow weathered aquifer in weathered shale and quartzite, semi-confined, groundwater 0.5–14 m below surface; (ii) a deeper fractured rock aquifer, artesian to 38 m below surface, locally confined by clay and shale; and (iii) the Malmani dolomitic karst aquifer, which lies approximately 100 m below the Deelkraal TSF and more than 400 m below the Kusasalethu TSF. No connectivity has been demonstrated between the weathered/fractured system and the underlying dolomite, even where dolomitic compartments have been dewatered. Aquifer parameters. Weathered aquifer T = 0.740 m²/day, K = 0.085 m/day; fractured aquifer T = 1.058 m²/day, K = 0.038 m/day. These are poorly developed aquifers that do not constitute economically	Decommissioning-phase significance ratings (EIMS methodology) Groundwater contamination from remining of the existing TSFs , decommissioning. Pre-mitigation −8 (Medium to low−) → post-mitigation −2.5 (Low−); priority factor 1.00 → final −2.50 (Low−). Groundwater contamination from the new TSF and RWD , decommissioning. Pre-mitigation −10 (Medium to high−) → post-mitigation −3.5 (Low−); priority factor 1.13 → final −3.94 (Low−). (For comparison, both impacts rate −12, Medium to high−, pre-mitigation during operation, reducing to −3.94, Low−, after mitigation.)



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	sustainable or exploitable units, although individual fractures may yield higher volumes (e.g. DKBH1D). Aquifer classification. Both the weathered and fractured aquifers classify as Minor Aquifer Systems with Low vulnerability, giving a Groundwater Quality Management index of 2 and a Low level of protection required (Parsons, 1995). Recharge and flow. Recharge is 3.7% of MAP (approximately 22 mm/annum against a MAP of 500–600 mm), calculated by the chloride method. Groundwater mimics topography (98% correlation at Kusasalethu). Flow at Deelkraal is northwards into catchment C23E (Varkenslaagte Spruit → Wonderfontein Spruit → Mooi River); at Kusasalethu it is to the south-west and south-east into catchment C23J (Loop Spruit → Mooi River at Potchefstroom → Vaal River). Existing contamination , Deelkraal (C23E). The down-gradient borehole pair DK BH TSF S/D shows clear impact, exceeding the 2020 Water Use Licence limits: EC 257 and 516 mS/m, TDS 1 806 and 5 000 mg/ℓ, sulphate 554 and 3 101 mg/ℓ, with manganese at 7.40 and 44.8 mg/ℓ. The deeper borehole is worst affected, confirming a connection between the weathered and fractured formations. The borehole down-gradient of the RWD shows only elevated manganese; the WRD borehole shows no impact. Existing contamination , Kusasalethu (C23J). All down-gradient boreholes show elevated sulphate: BH8 (Deep) 1 491 mg/ℓ, MBH16 1 152 mg/ℓ, BH9 1 091 mg/ℓ (with manganese 42.6 mg/ℓ) and BH8 (Shallow) 888 mg/ℓ. The greatest impact is to the south-west and south-east, consistent with flow direction; the elevated BH8D concentration suggests migration along a geological structure. MBH17 is slightly acidic (pH 5.32). Hydrocensus. Fourteen private boreholes were identified around Kusasalethu (ten still monitored); quality is mostly compliant with SANS	Post-closure groundwater behaviour Source removal is a net positive. Remining of the Deelkraal I and Kusasalethu TSFs removes the contaminant source. The impacted aquifer beneath each facility will dissipate through natural attenuation to below WUL limits over approximately 50 years , a slow process, because of the low aquifer parameters and low groundwater flow rate. The specialist concludes that the remining "will have a positive impact on the groundwater regime in the long run". Unlined Deelkraal II TSF and RWD (50-year scenario). Contaminant plumes migrate north-west and south. No down-gradient receptors are impacted within 50 years, and the facilities will be rehabilitated within that period. Lined Deelkraal II TSF and RWD (50-year scenario). The tailings classify as Type 3 waste under the NEMWA Regulations 2013, requiring Class C containment barrier performance (underdrainage, base preparation layer, 300 mm compacted clay liner, 1.5 mm geomembrane, 100 mm ballast/protection layer and above-liner drainage), with an expected seepage rate of approximately 140 ℓ/ha/day. An inverted barrier system would reduce this to approximately 6 ℓ/ha/day. The simulation shows very little plume movement away from the facilities. The liner lowers residual risk further but is expressly "not considered a prerequisite". Reduced source strength. The impact from the new TSF and RWD is expected to be significantly less than from the older facilities, owing to improved metallurgical processes and reduced sulphide content in the reworked tailings. Post-closure monitoring and contingency obligations

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	241:2015 and the WUL, but unacceptable bacteriological contamination occurs in HYD2, HYD3, HYD11, HYD12, HYD13 and HYD14. A new hydrocensus south of the Deelkraal TSF identified seven boreholes (three dry), a fountain and two dams; all groundwater complies with SANS 241, with iron and manganese exceeding limits only in surface water Dam 2 (MSW2). Remnants of illegal mining were recorded at the fountain. Numerical model. FEFLOW finite-element flow and mass-transport model over 655 km², 1 430 328 elements and 957 384 nodes, two layers (10 m weathered / 100 m fractured), calibrated against 41 boreholes to a 93% correlation. Sulphate was used as the conservative tracer. Current plumes. The Deelkraal plume migrates slowly northwards with a smaller easterly lobe, is contained within Harmony property and impacts no down-gradient receptors. The Kusasalethu plumes migrate south and south-west; they impact no private groundwater users but do impact two small streams.	Continued groundwater monitoring. The modelling findings must be verified and monitoring continued through operation, decommissioning and post-closure. Additional monitoring boreholes. A minimum of two borehole pairs (shallow and deep) north of the new TSF and a further two south of it, subject to terrain accessibility. Model updating. The numerical model must be updated if any deviation from the predicted contaminant migration is observed. Contingency remediation. Alternative remedial options, such as cut-off trenches, may be required to contain contamination if it is detected , a contingent closure cost to be provided for. Residual liability context. The existing Deelkraal and Kusasalethu plumes are pre-existing conditions that will persist for decades after closure; the acid-generation pathway (pyrite oxidation in the unsaturated zone) remains active in any tailings left in place, which is directly relevant to the cover and capping design for the final landform.
Agro-Ecosystem Assessment	Development footprint. 645.79 ha in total. The TSF covers approximately 430 ha in three compartments to a maximum final height of 65 m (capacities: C1 80.85 Mt, C2 53.9 Mt, C3 57.6 Mt), with deposition from 2028 to 2048 (C3 phased 2036–2048) at a maximum rate of rise of 4.98 m/yr by cyclone deposition. Associated infrastructure: return water dam approximately 11 ha, pump station approximately 3 ha, topsoil stockpiles approximately 37 ha, laydown areas approximately 70 ha, slurry pipelines approximately 10 km and process and potable water pipelines approximately 25 km in 4 m servitudes. Soils and land type. Land type Fb15 underlies the entire footprint. Shallow Glenrosa and Mispah lithosols with rock outcrop make up 57.3% of the land type. Average effective soil depth is 503 mm (depth class D2),	This is the only assessment that rates a discrete "Rehabilitation and Closure" phase, and the only one that identifies a positive closure impact. Rehabilitation and closure phase ratings Short-term soil disturbance during rehabilitation and closure. Pre-mitigation Medium to low− → post-mitigation Low− → final Low−. Arises from re-handling of stockpiled soil, decompaction and regrading of the final landform. Restoration of soil stability and re-establishment of grazing potential. Pre-mitigation Medium to low− → post-mitigation Low to medium POSITIVE → final Medium to high POSITIVE. This is the



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	with 38.18% of observations at 300 mm or shallower; average topsoil clay content is 21.6%. Land capability and sensitivity. Moderate sensitivity 268.44 ha (Avalon mAv26 244.50 ha, with Hutton Hu26 and Shortlands Sd11); Low sensitivity 120.52 ha (Glenrosa and Mispah); Transformed / Negligible 256.83 ha (39.8% of the footprint , the existing TSF and mine dumps). No observation point returned a High agricultural potential. Screening Tool verification. The DFFE Screening Tool "High" agriculture sensitivity is disputed; the Site Sensitivity Verification Report confirms Medium. Current land use. No formal cultivation in the past five years. Land use is informal free-range grazing (cattle, pigs and goats) with subsistence cultivation associated with the informal settlements. Agricultural production and employment attributable to the footprint are negligible. Specialist opinion. Conditional approval recommended; the Environmental Authorisation should be granted subject to the EMPr conditions. The No-Go alternative is not environmentally preferable from a soils perspective, as it forgoes the rehabilitation of 256.83 ha of already-transformed land and allows continued unmanaged dust and seepage. For the Kusasalethu reclamation laydown, Option 2 is preferred (negligible-potential rather than low-potential soil).	only positive rated closure-phase impact in the specialist suite and is the outcome the closure objectives and the rehabilitation quantum must be set to deliver. Operational and construction impacts that drive the closure liability Permanent loss of agricultural land use , operation. Pre-mitigation High− → post-mitigation High− → final High−. This is the only impact in any of the eleven studies that mitigation cannot reduce: the land beneath the TSF footprint is permanently removed from agricultural use, which constrains the achievable post-closure land use and the closure objectives that can be set for the facility footprint. Loss and degradation of the topsoil resource , construction. Medium to high− → Low− → final Low−. Governed by the Topsoil Salvage and Stockpiling Plan: topsoil stripped to 300 mm and subsoil to 1 000 mm (total excavation 1 300 mm), stripped and stockpiled separately, with stockpiles limited to 2.0 m in height. These are the governing figures for the soil balance and the topsoil handling quantum in the closure cost estimate. Reduction in future land capability , construction. Medium to high− → final Medium to low−. Compaction (reduced infiltration, aeration and root penetration) , construction. Medium to high− → final Low−. Requires mechanical subsoiling (ripping) of all linear servitudes after construction, and again at closure before topsoil replacement. Erosion and sediment loss , operation. Medium to high− → final Medium to low−. Requires a stormwater management plan with energy dissipaters, carried through the final landform design. Soil contamination , operation. Medium to low− → final Low−. Requires the barrier system to be constructed to the approved

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
		specification; residual contaminated soil must be removed at decommissioning. Dust deposition on soils , operation. Medium to low− → final Low−. Closure obligations carried into the FRDCP Soil replacement and landform preparation. Rip the subsoil before soil replacement; replace topsoil to approximately 300 mm across rehabilitated areas; re-vegetate with indigenous seed mixes appropriate to the vegetation type; install erosion control measures; implement invasive species management; and maintain monitoring and adaptive management until vegetation cover and land capability targets are met.
Air Quality Impact Assessment	Modelling. AERMOD with AERMET-processed WRF meteorological data for 2022–2024, over a 27 × 20 km domain at a 200 m grid resolution with receptors at 1.5 m. Winds are dominated by the northerly sector, with the strongest winds (>6 m/s) from the north to north-east; calms 3.5%; average wind speed 3.63 m/s. Sensitive receptors. Deelkraal, Elandsrand, Wedela, Elandsridge, Western Deep Levels, The Village and Southdene, together with individual homesteads to the north and south. Baseline dustfall. Kusasalethu (7 dustfall monitoring units, January 2020 – June 2025) is compliant with the residential limit, with a single exceedance recorded at DK6 in November 2020. Savuka and Mponeng (15 units, January 2022 – July 2025) record no exceedances. Emissions. Current West Wits operations 37.54 t/a PM2.5, 166.22 t/a PM10 and 394.18 t/a TSP. Future proposed operations 209.92 / 730.05 / 2 984.26 t/a. Future cumulative, including Savuka and Mponeng, 562.98 / 1 664.12 / 5 542.44 t/a. Deelkraal II and the two new stacks	The AQIA rates current and future operations; no separate decommissioning-phase rating is presented. Rehabilitation is, however, embedded in the mitigated operational rating. Current operations. Pre-mitigation −12.00 (Medium−) → post-mitigation −7.5, assuming 60% control efficiency from secondary rehabilitation of the dormant TSFs; priority factor 1.00 → final −7.5. Future operations (Kusasalethu upgrades and Deelkraal II). Pre-mitigation −12.00 (Medium−) → post-mitigation −9 (Low−); priority factor 1.00 → final −9. The mitigated rating is achieved only on the assumption of 80% control efficiency from grassing of the TSF side slopes, wet slurry deposition and 50% control efficiency water sprays on roads. Progressive vegetation of the side slopes is therefore an air quality compliance requirement as much as a closure obligation. Removal of the TSFs is the most effective mitigation. The specialist states that "the removal of the TSF would be the most effective mitigation measure, providing the exposed footprint be vegetated and rehabilitated". The reclamation of the Deelkraal I and



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	increase project emissions by 82% PM2.5, 77% PM10 and 87% TSP (37%, 44% and 54% respectively on a cumulative basis). Construction emissions. Estimated at 4 587 t/a TSP and 2 294 t/a PM10 for the infrastructure, plus 2 847 t/a TSP and 806.6 t/a PM10 for construction of the Deelkraal II TSF. These were not dispersion-modelled as no construction schedule was available , the same estimating basis would apply to demolition and rehabilitation earthworks at closure. Predicted concentrations. PM2.5 and PM10 24-hour and annual ground-level concentrations comply with the NAAQS at all receptors for both current and future operations. Average increases are 29% (daily) and 14% (annual) for PM2.5, and 31% and 22% for PM10. Dustfall. Current , no exceedance of the 600 mg/m²/day residential limit; the 400 mg/m²/day agricultural limit (Farmer, 1993) is exceeded up to 1.7 km south-south-west of the Deelkraal dormant TSF and 1.95 km south-south-west of the Kusasalethu TSF. Future , the agricultural limit is exceeded up to 4.7 km from the proposed Deelkraal II TSF, an average increase of 56%. Highest simulated 30-day dustfall: Deelkraal 91 (current) rising to 318 (future) and 319 (cumulative); Homestead ID 23 from 9 to 444 and 445 mg/m²/day.	Kusasalethu TSFs therefore delivers a net air quality benefit, conditional on rehabilitation of the vacated footprints , a direct closure cost that must be provided for. Cover and vegetation performance (closure design inputs). Wind erosion control efficiencies: non-sustaining vegetation 40%; re-vegetation 90%; secondary rehabilitation 60%; 300 mm fine rock cover 90% (100% where the base is levelled and compacted). Grassed slopes yield erosion of approximately 100 t/ha/yr against 500 t/ha/yr uncontrolled (Blight, 1989). These efficiencies determine the cover specification for the final landform. Post-closure monitoring obligations. Continue dustfall monitoring; relocate monitoring unit DK1 to the south-western boundary of Deelkraal town (27.313532, −26.461664); establish a new unit DK8 at the south-western boundary of the proposed Deelkraal II TSF (27.269988, −26.470146); continue quarterly inspections and annual environmental audits at least until closure; hold annual stakeholder forums and maintain a complaints register.
Climate Change Impact Assessment	Greenhouse gas inventory. Scope 1, 2 and 3 emissions quantified using the NGERs global warming potentials (CH_4 23, N_2O 296), with AR5 values presented for comparison. Current operations 20 701 t CO_2e/annum (Scope 1 140; Scope 2 19 573; Scope 3 988). Construction 152 234 t CO_2e, entirely Scope 3 (Deelkraal II TSF 131 085; Kusasalethu Gold Plant 21 149). Future operations 181 654 t CO_2e/annum (Scope 1 9 557; Scope 2 162 349; Scope 3 9 749) , dominated by purchased electricity. Regulatory classification. Scope 1 and 2 emissions exceed 100 000 t CO_2e/annum, so the project classifies as a "large facility": annual CO_2e reporting through the NAEIS is required, together with an annual Carbon	Rated by emission magnitude band rather than the EIMS matrix; no separate decommissioning rating is given. Construction phase. Scope 1 and 2 emissions of 19 713 t CO_2e → Very Low negative significance. Future operations. Scope 1 and 2 emissions of 171 906 t CO_2e → Medium negative significance (the 100 000 to 1 000 000 t CO_2e band). Emissions fall away progressively through decommissioning as reclamation, pumping and deposition cease; there is no material post-closure emission source.



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	Tax environmental levy account from the July following commencement of operations. Context. The project's Scope 1 and 2 emissions equal approximately 0.054% of South Africa's remaining 2035 carbon budget (320–380 Mt CO_2e) and approximately 0.04% of the 2022 national GHG inventory (435.12 Mt CO_2e including LULUCF). Climate projections (Green Book / CSIR, RCP4.5 and RCP8.5, 2021–2050). Temperature increase of 2.2 to 3.2 °C; very hot days rising from 0.9 per year to between 6 and 24.5 per year; annual rainfall increasing by 71 mm (RCP4.5) to 114 mm (RCP8.5); extreme rainfall days increasing by 1.1 to 1.6; a 28-day increase in fire danger days by 2050; SPI of −0.90 indicating an increased drought tendency (Low exposure); Medium risk of heat extremes and a Moderate potential increase in flooding exposure. Merafong vulnerability indices: socio-economic 4.5/10 and environmental 4.5, economic 2.6 and physical 2.4.	Increased rainfall as a closure design risk. The specialist states that "the projected increase in rainfall should be considered in the TSF design which may pose a risk to the structural stability in future". Together with the projected 1.1 to 1.6 additional extreme rainfall days, this is a direct input to the final landform, side-slope, cover and stormwater design, and to the long-term stability monitoring that must be provided for in the closure liability. Fire danger. The projected 28-day increase in fire danger days by 2050 affects the durability of the vegetated cover on the rehabilitated TSF and therefore the maintenance and re-vegetation component of the post-closure liability. Post-closure land use opportunity. The specialist notes that "the degraded land can be used for renewables instead of covering virgin land with acres of PV arrays", and identifies wheeling of renewable electricity and carbon offsets / REDD+ as mitigation. This is directly relevant to the post-closure land use objective and to the residual value of the rehabilitated footprint. Adaptation obligations that persist through closure. Contingencies for very hot days and extreme rainfall events to be built into the emergency response plans and the EMPr; thermal and electrical efficiency measures; adequate water supply; amended summer operating hours; and the community development programme.
Basic Environmental Noise Compliance Statement	Method and status. A basic compliance statement rather than a full noise impact assessment. CadnaA modelling to ISO 9613 was applied; no baseline noise survey was undertaken, and urban district rating levels were assumed (55 dBA day and 45 dBA night, per the draft SANS Environmental Noise Standards of June 2024). Exceedances. Predicted only at Elandsrand, approximately 160 m north-east of the gold plant to be upgraded: day-time construction (against the draft Standards, the Gauteng Noise Control Regulations 60 dBA limit and	This assessment expressly rates the decommissioning phase. Decommissioning. Pre-mitigation −8 (Medium to low−) → post-mitigation −6 (Medium to low−); priority factor 1.13 → final −6.75 (Medium to low−). Rated the same as construction, on the basis that demolition employs comparable plant and methods.



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	the National Noise Control Regulations "disturbing noise" +7 dBA criterion); day-time plant operations (draft Standards); and night-time plant operations (draft Standards and +7 dBA). Community reaction is expected to be "Medium", with widespread complaints, for day-time construction and night-time operations. Distances of exceedance. Construction , 400 m (draft Standards), 250 m (Gauteng 60 dBA) and 200 m (+7 dBA). Gold plant day-time , 250 m / 150 m / 100 m. Gold plant night-time , 800 m / 150 m / 400 m. The new TSF operations and the reclamation pump stations produce no exceedance at any distance. Specialist opinion. The project can be authorised subject to implementation of the recommended noise management measures.	For comparison. Construction: pre −8 → post −6; final −6.75 (Medium to low−). Operation: pre −10 (Medium to high−) → post −7.5; final −8.44 (Medium to low−). Post-closure. "Closure phase activities are expected to be similar or less significant and its impacts only assessed qualitatively. Noise impacts will cease post-closure." There is accordingly no residual post-closure noise liability, and no noise-related post-closure monitoring requirement. Decommissioning mitigation (as for construction). Staff trained on the noise control plan; use of "low noise" equipment and methods; avoid clustering mobile plant near receptors; provide rest periods for unavoidable maximum noise events; regular inspection and maintenance of equipment; avoid unnecessary idling; limit activities to day-time hours (06:00–18:00); enclose stationary equipment exceeding 85 dBA; engage the community before and during activities; communicate scheduling to residents within 400 m and complaint channels to all residents within 850 m; and maintain a noise complaints register.
Palaeontological Impact Assessment (Desktop)	Geology. The Rooihoogte, Timeball Hill and Hekpoort Formations of the Pretoria Group (Transvaal Supergroup), with Jurassic diabase intrusions. The northern pipeline corridor runs along the margin of the Malmani Subgroup (Chuniespoort Group). Palaeontological sensitivity. SAHRIS PalaeoMap , Malmani Subgroup Very High; Timeball Hill High; Hekpoort Moderate; Rooihoogte Low; diabase Zero. The DFFE Screening Tool returns High to Very High for the palaeontology theme. Nature of the resource. The elevated sensitivity is driven by microbially induced sedimentary structures (MISS), stromatolitic horizons and	Loss of fossil heritage , construction and normal operation. Nature −1, Extent 1, Duration 5, Magnitude 4, Reversibility 5 → Consequence −3.75 × Probability 3 = pre-mitigation −11.25 (Medium to high−). Post-mitigation, with Magnitude reduced to 1: Consequence −3 × Probability 2 = −6 (Medium to low−); cumulative impact 1 and irreplaceable loss 3 → priority factor 1.25 → final −7.5 (Medium to low−). Decommissioning and closure. The specialist states that "no significant palaeontological impacts are anticipated during the operational or decommissioning phases". Impacts are confined to the excavation footprint during construction; there is no residual



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	carbonate-hosted microbial assemblages, rather than by discrete recoverable macrofossils. Scope of disturbance. Pipelines are carried above ground on pre-cast plinths with shallow footings only, and a formal site investigation was therefore not considered necessary. Specialist opinion. No objection to authorisation, subject to implementation of the Chance Find Protocol.	palaeontological liability at closure, and the No-Go alternative rates Neutral. Cumulative impact is Low both before and after mitigation. Chance Find Protocol. To be implemented and adhered to throughout all phases involving excavation, including rehabilitation earthworks: halt work in the affected area, preserve the material in situ, and notify SAHRA within 24 hours with photographs and GPS coordinates. A collection permit must be obtained before any material is removed, and recovered material must be housed in an accredited institution in accordance with the SAHRA (2012) minimum standards. Financial provision implication. No provision is required for palaeontological rehabilitation or post-closure monitoring; the only residual obligation is the standing Chance Find Protocol during any closure-phase excavation.
Landscape and Visual Impact Assessment (LVIA)	Assessment level. A Category 5 development ("large scale infrastructure") within an "area of low scenic, cultural and historical significance / disturbed" in terms of the Western Cape Guideline, warranting a Level 3 assessment. This may be elevated to a Level 4 assessment with visual simulations should significant impacts be identified or the competent authority require it. Scale and visibility. The TSF has a maximum height of 65 m on a site reaching approximately 1 614 mamsl, so the crest could reach approximately 1 679 mamsl. The approximate limit of visibility is 28.8 km for the TSF and 2.5 km for the overhead powerline. Pipelines are above ground to a maximum diameter of 500 mm and are visible only from adjacent roads. Landscape character. Three Landscape Character Areas: the east–west ridgelines and valleys (Low sensitivity) and the flat rural areas to the north and to the south (Medium sensitivity). No High-sensitivity Landscape Character Areas, no No-Go areas and no Highly Sensitive	The LVIA rates the construction and operational phases; the operational ratings represent the residual visual condition that rehabilitation must address. Final significance ratings Landscape change. Construction −2.35 (Low−); operational −5.625 (Medium-Low−). Views from the main roads (N12 and R501). Construction no impact; operational −5.0 (Medium-Low−). Views from local mine roads. Construction −3.35 (Low−); operational −5.0 (Medium-Low−). Boskopdam Nature Reserve. Construction no impact; operational −5.0 (Medium-Low−).



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	areas were identified. The Medium-sensitivity areas , those adjacent to residential areas, and the ridgelines with a 100 m buffer , are sensitive to large-scale site storage and contractors' camps. Receptors. Deelkraal, Elandsridge and Wedelia mining villages (less than 1 km to 6.2 km); Boskopdam Nature Reserve approximately 16 km to the west and the Deelkraal Passive Recreation Area, both of High receptor sensitivity; the R501, N12 and minor roads; and individual homesteads to the north and south. Zone of theoretical visibility. View corridors extend approximately 10 km to the north and 5 km to the south. The facility would be visible from Boskopdam Nature Reserve at over 17 km (upper section only, unlikely to be discernible), from approximately 9 km of the R501 (minimum distance 7.6 km) and from approximately 15 km of the N12 (minimum distance 6.5 km). Specialist opinion. There is no reason from a landscape and visual perspective why the development should not be authorised.	Deelkraal Passive Recreation Area. Construction −3.35 (Low−); operational −7.5 (Medium-Low−) , the highest-rated visual receptor. Mine village residents. Construction −1.75 and operational −1.75 (Low−). Homesteads north and south. Construction no impact; operational −5.0 (Medium-Low−). Lighting. Construction 1.25 and operational 1.25 (Low−). Closure and rehabilitation obligations Incremental rehabilitation as the primary visual mitigation. "Undertake rehabilitation of the TSF on an incremental basis in order to help the side slopes of the facility blend visually with the surrounding landform." Concurrent rehabilitation is therefore a visual mitigation requirement as well as an air quality and closure requirement, and the visual ratings above assume it is carried out. Vegetation and remedial action. Reinstate, augment and maintain the retained natural vegetation; monitor rehabilitated areas after construction and implement remedial action where establishment fails. Removal of temporary works. Remove all temporary works, storage areas and contractors' camps and rehabilitate their footprints; such facilities are in any event to be located away from the Medium-sensitivity areas. Height as a residual design variable. The zone of theoretical visibility was modelled at 65 m, 55 m, 45 m and 35 m. At 35 m, visibility from Boskopdam Nature Reserve is largely prevented, so alternative deposition on the Old Savuka / DF5 footprints would reduce both the operational and the residual post-closure visual



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
		impact. Powerline Alternative 1 is favoured, although both alternatives are acceptable. Financial provision note recorded by the specialist. The LVIA records that "Deelkraal I TSF is part of Kusasalethu financial provision", and that provision for the rehabilitation funding of Deelkraal II TSF is "to cost for first year of construction as part of closure cost assessment study".
Traffic Impact Statement (TIS)	Assessment status. A Traffic Impact Statement rather than a full Traffic Impact Assessment, on the basis that the development generates fewer than 150 vehicle trips in the peak hour (the TMH 16 Volume 1 threshold). Tailings are transported by pipeline, so road-based transport is minimal. Road network. N12 (Class 2, SANRAL), R500 (Class 2 dual carriageway, SANRAL), R501 (Class 2, SANRAL), D92 (Class 2 arterial, GDRT , 16.3 km, 7.4 m paved width), D1648 (Class 4 collector, GDRT , 5.5 km, 8.0 m paved width) and local access roads under Merafong City Local Municipality. Traffic volumes. Average daily traffic: N12 8 890 (18% heavy vehicles), R500 9 421 (3%) and R501 9 332 (12%); peak hour taken as 13% of ADT. GPDRTRAMS 2025 ranges: N12 6 303–11 103; R500 6 247–9 505; R501 992–5 335; D92 1 107–1 322; D1648 1 469–2 276. Spare capacity is available on all links and at all nine assessed intersections. Access. Eight site access points are listed. All informal and proposed private accesses off provincial roads require approval from the affected road authority, and the proposed D92 site access must be consolidated with the nearest existing intersection to eliminate substandard access spacing. Phases assessed. Only the construction, operational and decommissioning phases were considered to require investigation in the EIA phase; planning and rehabilitation phase traffic is negligible.	Decommissioning is expressly assessed alongside construction. Deterioration of road network condition , construction and decommissioning. Medium before mitigation → Low after mitigation. The specialist records that "heavy vehicle traffic during both construction and decommissioning phase of the development are expected to cause additional wear and tear on the surrounding road network. The gravel roads to the sites are also expected to sustain damage during the construction and decommissioning phase (i.e. surface distress , gravel loss leading to damage to the existing gravel road layers and rutting)." Mitigation: continuous monitoring and upgrading of the affected network, and limiting heavy and overloaded vehicles. Dust along gravel access roads , construction and decommissioning. Medium → Low. Mitigation: regular wet grading and wetting for dust suppression, and limiting dust-generating activities during periods of strong wind. Applies equally to demolition and rehabilitation haulage. Additional traffic volumes, intersection capacity and road safety. Low → Low. Mitigation: schedule development traffic outside the existing peak periods and encourage the use of public transport by the workforce.



Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	Rating scale. The TIS applies a qualitative Before / After Mitigation scale (Medium, Low), not the EIMS numeric scale. The Plan of Study lists "Updating of Impact Significance and Ratings" as an outstanding EIA-phase task, so numeric ratings are still to be issued.	Abnormal loads. Medium → Low. Mitigation: traffic management strategies including temporary road signage, flagmen and reduced temporary speed limits , directly relevant to the removal of plant, pipelines and structures at decommissioning. Closure-relevant obligations. Rehabilitation of redundant access roads and servitudes; repair of road damage attributable to project traffic; and reinstatement or formal closure of the private accesses onto the provincial road network, each subject to road-authority approval. Overall conclusion. Sufficient capacity exists on the N12, R500, R501, D92 and D1648 and at the existing intersections during construction and operation, subject to the traffic management strategies; the overall potential impact is moderate to low.
Social Impact Assessment (SIA)	Regional context. Merafong City Local Municipality, West Rand District Municipality , the poorest-performing region in Gauteng by GDP contribution. Mining now contributes only about 2.95% of local Gross Value Added. Population 225 476 (Census 2022), average household size 2.9; approximately 46.5% of the working-age population employed, 17% unemployed and 33% economically inactive; total dependency ratio 40.95%. Dominant home languages are Setswana (28%), isiXhosa (26%) and Sesotho (21%). Deelkraal Village. A self-contained former mine village with a prolonged loss of electricity supply following the plundering and burning of the local power station and theft of power-line towers; sewage can no longer be pumped and the village relies on tankered water. Approximately 38 houses stand vacant and vandalised. The resident population includes elderly and ill persons, including persons dependent on oxygen. The village is subject to a court-supervised arrangement and internal rent and service-payment disputes.	Decommissioning and closure phase ratings Loss of employment and income at closure (decommissioning). Pre-mitigation −12 (Medium to high−) → post-mitigation −4 (Low−); priority factor 1.00 → final −4.00 (Low−). Managed through early closure planning, retrenchment procedures and portable-skills training. Post-closure safety and land-use uncertainty (rehabilitation and closure). Pre-mitigation −10.5 (Medium to high−) → post-mitigation −4 (Low−); priority factor 1.00 → final −4.00 (Low−). Managed through progressive rehabilitation, long-term stability monitoring and clear communication of closure timelines and safety measures. Operational-phase impacts that persist into and beyond closure Fear of, and exposure to, TSF or pipeline failure and seepage. Pre-mitigation −20 (High−) → post-mitigation −10.5 → final −13.13 (Medium to high−). The most significant subjective impact and the one most directly engaged by the GISTM, heightened because local

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	Farms and smallholdings. Cattle and game farming, with some farms dependent on an on-farm dam, a stream and mine-associated runoff as the only water source for livestock, game and people. Persistent stock and infrastructure theft; seismic tremors and structural cracking reported. Informal occupiers and artisanal miners. A settlement of informal occupiers, present since approximately 2009 with artisanal mining from about 2016, keeps 200–400 cattle plus goats, pigs and poultry and cultivates crops on the proposed TSF footprint. This is reportedly the only cattle kraal in the immediate area. Occupants are largely illiterate with limited English and hold no formal legal authority to occupy. Land-ownership dispute. A material dispute affects certain portions within the project area; parties contend that land and surface rights were sold and should have been transferred, have objected to the project and have indicated that litigation may be pursued. Recorded as a stakeholder position, not a finding of fact, but relevant to project legitimacy, land access and the social licence to operate. GISTM. Because the project centres on a TSF, the social-performance requirements of the Global Industry Standard on Tailings Management apply across all six Topic Areas , 14 of the 77 requirements contain explicit social-performance components and a further 18 require social inputs. Vulnerable groups. Elderly and ill residents of Deelkraal Village; informal occupiers and artisanal miners; unemployed youth; women and female-headed households; tenants and occupiers without secure tenure; and local SMMEs and informal traders. Specialist opinion. No fatal flaw. Most impacts are a continuation or intensification of existing impacts rather than new ones. The project is recommended for support from a social perspective on condition that the Social Impact Management Plan (SIMP) and the report's	drainage reports to the Mooi River system and downstream to the Boskop and Potchefstroom dams. Requires meaningful engagement of affected people and downstream users in Emergency Preparedness and Response Planning, specific consideration of vulnerable residents in evacuation arrangements, and full GISTM compliance for the life of the facility , which extends beyond closure. Cumulative impact on an already-stressed environment. Pre-mitigation −13 → post-mitigation −9.75; priority factor 1.38 → final −13.41 (Medium to high−). This is the only impact that cannot be reduced below medium-to-high significance, and it is the impact most directly tied to the adequacy of closure and rehabilitation. Continued nuisance (dust and visual intrusion). Operation: pre-mitigation −12 (Medium to high−) → post-mitigation −4 (Low−) → final −4.50 (Medium to low−). Progressive vegetation of completed TSF sections is an identified mitigation, linking dust management directly to concurrent rehabilitation. Potential displacement and livelihood loss of informal occupiers. Pre-mitigation −18.75 (High−) → post-mitigation −11 → final −12.38 (Medium to high−). Must be addressed in line with international standards on involuntary resettlement and livelihood restoration (IFC PS5), recognising vulnerability irrespective of tenure status , with implications for post-closure land use, grazing and cultivation. Closure obligations carried into the FRDCP and SIMP SIMP item 15 , closure planning. Plan for closure early, including retrenchment procedures, portable-skills training, progressive rehabilitation, long-term stability monitoring, and clear communication of closure timelines and safety measures; output is a closure and social transition plan.

Specialist assessment	Specialist findings	Impacts identified by specialist for decommissioning, rehabilitation and closure phase
	recommendations are implemented and incorporated into the conditions of the Environmental Authorisation.	SIMP item 12 , GISTM through the life of the TSF. Human-rights due diligence, meaningful engagement, grievance handling, emergency preparedness co-developed with affected people, and public disclosure, sustained for the life of the facility including post-closure. SIMP item 13 , emergency preparedness and recovery. Emergency Preparedness and Response Plans co-developed with employees, contractors and affected people (including downstream users and vulnerable residents), with public-sector agencies engaged on medium- and long-term recovery. Explicitly required through operation and closure. Continued stakeholder function and grievance mechanism. The Stakeholder Relations function, Community Liaison Officer and a community-friendly grievance mechanism must be resourced and maintained through all phases, including a closure-stage grievance mechanism. Positive closure-relevant outcomes. Re-use of historical tailings, recycling of process water and avoidance of new greenfield mining disturbance are rated Medium to high positive (final +13.00) and constitute a net benefit that would fall away if the project did not proceed.



2.16.3 RISK ASSESSMENT FOR REHABILITATION AND CLOSURE

A detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed activities is provided in the EIAR (2026). This risk assessment assesses each identified environmental impact by considering the consequence of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood of the impact occurring. The EIA further considers other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, to determine a prioritisation factor (PF) which is applied to the Environmental Risk to determine the overall significance.

Table 28 lists the environmental impacts and risks identified and assessed in the EIA (2017), which relate to final rehabilitation, decommissioning and closure of the exploration. The EMPr addresses the management and mitigation of environmental impacts associated with the construction and operational phases whilst the three reports and plans as prescribed in the Financial Provisioning Regulations, 2015 (to be reviewed annually) and the DMR Quantum Determination Guidelines will provide for the planning and financial provisioning for the concurrent rehabilitation and final closure of the proposed activities.

The applicable conceptual closure strategy to avoid, manage and mitigate the impacts and risks are also included in Table 28, together with the reassessment of the environmental risk. The environmental risk assessment of the impacts associated with final rehabilitation, decommissioning and closure will inform the most appropriate closure strategy for the project. It is expected that, in most cases, if all the management and mitigation measures identified in the EIA and EMPr are adhered to and successfully implemented, then no latent or residual environmental impacts will remain. Impacts that are classified as high-risk post-mitigation will be considered as latent environmental impacts and financial provision will be provided to remediate these specific impacts. Please see Table 28 for further details.



Table 28: Summary of impacts and mitigations.

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
Residual porewater and contaminated footprint soils remaining after removal of the tailings source.	Groundwater contamination from new TSF & RWD	Medium to low -	Strip and dispose of, or treat, residual contaminated footprint material; rip, topsoil and revegetate the vacated footprints to limit infiltration; continue quarterly monitoring through decommissioning and into post-closure; confirm attenuation trends against the WUL limits.	Low -
Continued drainage of tailings porewater from the residue mass during the transition to the closed landform.	Groundwater contamination from new TSF & RWD	Medium to high -	Maintain the underdrainage and seepage collection until porewater quality stabilises; cap and shape the facility to shed water and limit infiltration; decommission the RWD only once the closure water balance permits; continue quarterly groundwater monitoring; update the numerical model with post-closure boundary conditions.	Low -
Erosion of freshly placed cover and topsoil before vegetation establishment, and sediment delivery to the receiving drainage.	Erosion of soils	High -	Design the final landform free-draining, erosion-resistant and without ponding (DWS BPG G5); install energy dissipaters, contour berms and armoured discharge points; seed immediately after topsoil	Medium to high -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			placement and use mulch or a tackifier on steep slopes; inspect weekly during works and quarterly post-closure until the erosion-control criterion is met; repair rills and gullies as they appear.	
Exposure of bare soil and disturbance of established drainage lines generating sediment-laden runoff.	Erosion of soils	Medium to high -	Retain the stormwater controls until rehabilitation is complete; work in phases so the exposed area at any time is limited; install temporary sediment traps and silt fences down-gradient; reinstate drainage lines to their natural alignment and stabilise them; seed disturbed areas immediately on completion.	Medium to high -
Release of residual slurry, process water, hydrocarbons and demolition washings to the receiving drainage.	Pollutants entering the surface water environment	Medium to high -	Flush and drain all pipelines and vessels to the process circuit before dismantling; work over drip trays and within bunded areas; retain the dirty water containment system until all contact-water sources are removed; classify, remove and dispose of contaminated soil at a licensed facility; monitor surface water quality through the decommissioning period.	Medium to high -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
Residual poor-quality runoff and seepage from the rehabilitated landform reporting to the receiving environment once active controls are removed.	Pollutants entering the surface water environment	High -	Demonstrate compliance with the closure water-quality criteria before decommissioning the dirty water system; retain the cover and capping design that limits infiltration and acid generation; hold a passive treatment or containment contingency in the ERA liability; monitor surface water quality quarterly post-closure until the criteria are consistently met.	Medium to high -
Restoration of catchment runoff to the downstream systems as the diversion works are removed.	Decrease in runoff	High -	Design the final landform to be free-draining and to return runoff to the natural drainage alignment; remove diversion berms and channels only once the rehabilitated surface is stable; reinstate and stabilise the reconnected drainage lines; monitor downstream flow and channel condition until the closure criteria are met.	Medium to low -
Demolition noise exceeding the day-time district rating level and the +7 dBA disturbing-noise criterion at Elandsrand.	Incremental increase in noise levels exceeding noise criteria at potential sensitive receptors (i.e. residential areas and individual dwellings)	Medium to low -	Apply the construction noise controls in full , low-noise equipment, no clustering of plant near receptors, rest periods for maximum noise events, regular maintenance, no unnecessary idling, activities	Medium to low -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			limited to 06:00–18:00 and enclosure of stationary equipment exceeding 85 dBA; notify residents within 400 m in advance; maintain the complaints register.	
Vegetation clearance and physical disturbance of habitat within and adjacent to the decommissioning footprint, and noise, vibration, lighting, human presence and open excavations displacing, trapping or killing fauna.	Habitat disturbance, loss of vegetation cover and displacement, disturbance and mortality of fauna during demolition and decommissioning earthworks	Medium to high -	Confine demolition and earthworks to the existing disturbed footprint and demarcate no-go areas around High SEI rocky habitat and Class 1 Ridges; obtain protected-species relocation or destruction permits from the Gauteng Department of the Environment before any clearing; undertake a wet-season (October–March) walkdown of High SEI areas before works commence; pre-clearance faunal walkthrough and search-and-rescue by a qualified specialist; prohibit hunting, trapping and collection by staff and contractors; cover or ramp all open excavations daily; restrict demolition to daylight hours and shield any necessary lighting; remove fences and other barriers to faunal movement progressively; rehabilitate and revegetate each footprint as it	Medium to low -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			falls out of use, under ECO oversight.	
Vegetation and habitat disturbance, soil compaction, erosion and sediment generation and polluted runoff entering wetlands, together with disruption of the hydric soil profile and altered surface flow and shallow subsurface connectivity across HGM 1–8 and HGM 10–12.	Wetland degradation, disruption of the soil profile and hydrological regime, and increased sediment loads from decommissioning of infrastructure intersecting wetlands	Medium to low -	Demarcate wetlands and their buffers (25 m specialist-assigned, or the GDARDE 50 m rural buffer where not relaxed) as no-go outside the authorised footprint; work in the dry season where practicable; install silt fences, sediment traps and erosion control down-gradient of every wetland crossing; refuel and service plant outside the buffer only; strip and stockpile wetland-related soils separately and replace them in sequence; decompact and reinstate the original ground profile and drainage alignment, reinstating diffuse surface flow and shallow subsurface connectivity rather than channelised flow; authorise all crossings and directly affected wetlands under the applicable water use authorisation; weekly ECO and freshwater-specialist inspection during decommissioning and quarterly hydrological monitoring post-closure; review and update the DWS	Medium to low -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			Risk Assessment Matrix if the layout changes.	
Compaction, loss of soil structure and hydrocarbon or chemical contamination of soils, together with the generation of general and hazardous waste streams requiring classification, on-site storage, re-use, recycling or licensed off-site disposal.	Soil compaction and contamination, and generation of demolition rubble, scrap, contaminated soil and hazardous waste	Medium to high -	Prepare a demolition waste management plan before works begin and classify all waste streams in terms of the NEMWA and the Waste Classification and Management Regulations; segregate at source and maximise re-use and recycling of scrap steel, concrete and yard stone; store hazardous waste in bunded, covered areas and retain safe-disposal certificates; demolish concrete and reinforced-concrete structures to 1 m below final surface level and dispose of residual waste only at licensed facilities; confine plant movement to designated routes and hardstands; strip, classify and dispose of hydrocarbon- and chemically contaminated soil at a licensed facility; remove yard stone and hardpark material before soil replacement; rip all compacted areas to at least 300 mm before topsoil placement; bund and drip-tray all demolition plant fuelling and servicing.	Medium to low -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
Hydrocarbon spills, cement and concrete washings and demolition debris entering the clean and dirty water systems and reporting to the Mooi River catchment.	Hydrocarbon, demolition and chemical contamination of stormwater runoff	Medium to high -	Bund fuel and chemical storage to 110% capacity; refuel and service on impermeable bunded surfaces only; provide spill kits at every work front and maintain a spill register; contain concrete and demolition washings away from drainage lines; flush and drain all pipelines and vessels to the process circuit before dismantling; retain the dirty water containment system until all contact-water sources are removed; monitor surface water quality upstream and downstream through the decommissioning period.	Low -
Fugitive particulate emissions (PM2.5, PM10 and TSP), dustfall and combustion emissions from demolition plant and vehicle entrainment, together with temporary change in landscape character and visual intrusion for Deelkraal, Elandsrand, Elandsridge and Wedela residents and for road users.	Dust, particulate emissions and visual intrusion from demolition works, earthworks, stockpiles and haulage	Medium to high -	Wet-suppress unpaved roads and active demolition areas (approximately 50% control efficiency); cover or wet loads hauling rubble and demolition material; limit vehicle speeds on unpaved roads and suspend dust-generating work during periods of strong wind; maintain dustfall monitoring including DK1 and the new DK8 unit through the decommissioning period; keep demolition areas tidy and	Medium to low -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			confined and screen laydown from the Medium-sensitivity Landscape Character Areas; remove all temporary works, storage areas and contractors' camps and rehabilitate their footprints as they are released; shield and direct any night lighting downward; maintain the complaints register.	
Surface distress, gravel loss, rutting and road-safety risk from heavy and abnormal vehicle movements, and dust along the gravel access roads.	Deterioration of road network condition from demolition haulage and abnormal loads	Medium to high -	Continuously monitor and, where required, upgrade the affected network; limit heavy and overloaded vehicles and enforce axle-load limits; wet-grade and wet the gravel access roads for dust suppression and limit dust-generating activity during strong wind; schedule demolition traffic outside peak periods; apply traffic management for abnormal loads (temporary signage, flagmen, reduced speed limits); repair road damage attributable to the project and rehabilitate redundant access roads and servitudes, subject to road-authority approval.	Low -
Retrenchment and loss of household income, local procurement and municipal	Loss of employment and income at closure	Medium to high -	Plan for closure early in accordance with SIMP item 15, including retrenchment	Low -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
revenue in an already economically stressed Merafong City.			procedures and a closure and social transition plan; provide portable-skills training well before demobilisation; give the workforce and community advance notice of the closure timeline; prioritise local labour for rehabilitation and post-closure monitoring contracts; maintain the stakeholder forum and grievance mechanism through closure.	
Disturbance of previously unexposed microbially induced sedimentary structures, stromatolitic horizons or subsurface heritage material within the Timeball Hill and Malmani formations.	Damage to, or chance find of, palaeontological or heritage material during decommissioning and rehabilitation excavation	Medium to low -	Implement the Chance Find Protocol throughout all phases involving excavation, including rehabilitation earthworks: halt work in the affected area, preserve the material in situ and notify SAHRA within 24 hours with photographs and GPS coordinates; obtain a collection permit before any material is removed; house recovered material in an accredited institution in accordance with the SAHRA (2012) minimum standards; induct all earthworks crews.	Low -
Establishment and spread of alien and invasive plant species	Proliferation of alien and invasive plant species on	Medium to high -	Maintain and update the Alien and Invasive Plant Management Plan annually; survey rehabilitated and disturbed	Medium to low -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
on freshly disturbed and revegetated surfaces.	disturbed and rehabilitated areas		areas at least twice a year and treat before seed set; use only certified weed-free indigenous seed mixes endemic to the vegetation type; undertake follow-up rehabilitation and re-vegetation of remaining denuded areas; carry AIP control into the post-closure maintenance liability until the vegetation closure criterion is met.	
Re-establishment of vegetation cover, habitat function and ecological connectivity on previously transformed land, and reinstatement of diffuse surface flow and shallow subsurface connectivity improving wetland PES toward the Recommended Ecological Category.	Re-establishment of indigenous terrestrial and wetland habitat and reinstatement of wetland function on the rehabilitated footprint	Low to medium +	Implement the habitat rehabilitation and revegetation plan and the targeted wetland rehabilitation plan; rip the subsoil and replace topsoil and wetland-related soils in sequence before seeding; remove redundant fill, berms and flow obstructions, regrade and stabilise, and reinstate diffuse surface flow; revegetate with indigenous species endemic to the vegetation type and with locally indigenous wetland and riparian species; prioritise rehabilitation of already-disturbed areas; control alien invasive plants; monitor species composition, basal cover and wetland PES against the closure criteria, re-	Medium to high +



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			seed where establishment fails, and maintain compliance monitoring and adaptive management until relinquishment.	
Temporary exposure of bare soil with wind and water erosion, dustfall at Deelkraal, Elandsrand and surrounding homesteads, and noise from earthmoving plant and haulage at receptors within 850 m, during the period between soil placement and vegetation establishment.	Short-term soil disturbance, erosion, dust and noise during rehabilitation earthworks, cover placement and revegetation	Medium to high -	Re-handle stockpiled soil in dry conditions and avoid trafficking wet soil; minimise the interval between regrading, cover placement and seeding; apply mulch, a tackifier or a nurse crop to bare surfaces; where sustaining vegetation cannot be established, place a 300 mm fine rock cover on a levelled and compacted base (90–100% wind-erosion control against 40% for non-sustaining vegetation); phase rehabilitation so the exposed area at any time is limited; install contour berms and energy dissipaters before the rainy season; restrict earthworks to 06:00–18:00, use low-noise well-maintained equipment, avoid clustering plant near Elandsrand and Deelkraal and avoid unnecessary idling; notify residents within 400 m of the rehabilitation schedule; continue dustfall monitoring,	Medium to low -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			maintain the complaints register, and monitor and repair erosion until the vegetation cover criterion is met.	
Re-establishment of the soil profile, infiltration and rooting depth supporting grazing land capability on 256.83 ha of previously transformed land.	Restoration of soil stability and re-establishment of grazing land capability	Medium to low -	Rip the subsoil before soil replacement; replace topsoil to approximately 300 mm across rehabilitated areas in accordance with the Topsoil Salvage and Stockpiling Plan (topsoil stripped to 300 mm, subsoil to 1 000 mm, stockpiles limited to 2.0 m); revegetate with indigenous seed mixes appropriate to the vegetation type; install erosion control and manage invasive species; monitor land capability and vegetation cover against the relinquishment criteria and apply adaptive management until they are met.	Medium to high +
Irreversible removal of land from agricultural production; irreversible transformation of non-resilient High SEI habitat (more than 15 years to restore less than 50% of species composition and functionality); and complete loss of wetland habitat, ecosystem services and hydrological function in	Residual permanent loss of agricultural land capability, High SEI terrestrial habitat, Class 1 Ridge and wetlands (HGM 1, 2 and 4) beneath the facility footprint	High -	Mitigation cannot restore the facility footprint to its pre-mining land capability or habitat. Avoid High SEI rocky habitat and Class 1 Ridges entirely and hold the 200 m buffer for high-impact development; optimise the layout to avoid HGM 1, HGM 2 and HGM 4 as far as the facility	High -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
systems classified Critically Endangered and Not Protected.			design allows; where loss is unavoidable, authorise it under the applicable water use authorisation and secure biodiversity and wetland offsets as a measure of last resort for the residual loss; offset the agricultural loss by rehabilitating the 256.83 ha of already-transformed land to grazing capability; set the post-closure land use for the facility footprint to a use the rehabilitated capability can support (for example renewable energy generation on the degraded landform); rehabilitate and improve the PES of all retained and hydrologically connected systems; record the residual loss as a permanent closure outcome in the FRDCP and the ERA and agree differentiated land-use objectives per rehabilitation domain with the competent authority and affected landowners.	
Continued seepage of sulphate- and manganese-bearing porewater into the weathered and fractured aquifers (pyrite oxidation remains active in	Residual seepage, plume migration and poor-quality post-closure runoff from the rehabilitated landform	High -	Complete the outstanding surface water, stormwater and closure water balance study; cap and shape the facility to shed water and minimise	Medium to high -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
tailings left in place), and contact water and sediment-laden runoff reporting to the Varkenslaagte / Wonderfontein and Loop Spruit systems and downstream to the Boskop and Potchefstroom dams.			infiltration and pyrite oxidation in the unsaturated zone; design the final landform free-draining, erosion-resistant and without ponding in accordance with DWS BPG G5; keep the underdrainage and seepage collection operational until porewater quality stabilises and demonstrate compliance with the closure water-quality criteria before decommissioning the dirty water system; maintain the minimum two shallow / deep borehole pairs north and two south of the facility and update the FEFLOW model on any deviation from predicted migration; monitor surface and groundwater quality quarterly post-closure with defined corrective-action triggers; provide for cut-off trenches or passive treatment and containment as contingency remediation in the ERA liability.	
Cessation of sulphate and manganese loading to the aquifers, allowing natural attenuation of the existing plumes to below WUL limits over approximately 50 years;	Net environmental benefit from removal of the dormant Deelkraal I and Kusasalethu TSFs	Medium to high +	Complete the reclamation of both dormant facilities and rehabilitate and revegetate the vacated footprints promptly and to a natural profile, so that the exposed footprint does not	Medium to high +

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
permanent removal of the principal wind-erosion source and of the existing exceedance of the 400 mg/m²/day agricultural dustfall limit up to 1.7–1.95 km; and removal of existing visual detractors from the landscape.			become a replacement dust source and does not sustain infiltration; continue quarterly groundwater monitoring at the down-gradient boreholes to confirm the predicted approximately 50-year attenuation, and continue dustfall monitoring to verify the air quality improvement; reinstate and augment retained natural vegetation as foreground screening; report attenuation trends in the annual financial provision review and rehabilitation progress at the annual stakeholder forum; retain the monitoring obligations in the post-closure liability until the closure criteria are met.	
Permanent alteration of landscape character and of views from the Deelkraal Passive Recreation Area, the R501, the N12 and the mine villages.	Residual change in landscape character from the rehabilitated TSF landform	Medium to high -	Rehabilitate the TSF incrementally so that the side slopes blend visually with the surrounding landform; shape the final landform to a natural, rounded profile rather than an engineered terrace; revegetate the slopes and crest with indigenous grasses; consider the reduced-height deposition alternatives (55 m / 45 m / 35 m, or the Old Savuka / DF5	Medium to low -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
			footprints) to lower the residual visual impact; monitor establishment and remediate failures.	
Public access to, and safety on, the rehabilitated TSF and residual water bodies; uncertainty over post-closure land use and tenure; and loss of grazing for a reported 200–400 cattle plus goats, pigs and poultry and of subsistence cultivation on land used by informal occupiers and surrounding farmers.	Post-closure safety, restricted access and land-use uncertainty, including loss of grazing and cultivation land used by informal occupiers	High -	Undertake progressive rehabilitation rather than deferring it to closure; maintain long-term stability monitoring under the GISTM including post-closure; fence, sign and control access to the rehabilitated landform and residual water bodies until the safety criteria are met; apply IFC PS5 livelihood restoration irrespective of tenure status and identify and secure alternative grazing land before access is lost; phase the release of rehabilitated land back to grazing as the vegetation cover criteria are met; communicate closure timelines, land use and safety measures clearly and in a form accessible to those with limited literacy and English; monitor livelihood restoration outcomes and maintain a closure-stage grievance mechanism through the aftercare period.	Medium to high -

Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
Temporary employment, portable-skills training and procurement opportunities for local labour and SMMEs during the closure and aftercare period.	Short-term rehabilitation employment, portable-skills transfer and local procurement	Low to medium +	Prioritise local labour and SMMEs for rehabilitation, alien vegetation control and post-closure monitoring contracts; provide portable-skills training (earthworks, revegetation, monitoring) that remains marketable after the contract ends; report closure-phase employment and procurement at the stakeholder forum; align with the SLP and the closure and social transition plan.	Medium to high +
Erosion gullying, side-slope instability or breach of the final landform, with release of tailings and sediment to the Varkenslaagte and the Mooi River system.	Long-term physical instability of the rehabilitated TSF landform	Medium to high -	Design the final landform for long-term physical stability under the projected extreme-rainfall regime; complete the geotechnical, cover and closure landform design and the dam-break analysis; establish long-term stability monitoring (survey beacons, piezometers and scheduled inspections) under the GISTM, continuing post-closure; define corrective-action triggers and hold repair and maintenance provision in the ERA liability; control public access until the stability criteria are met.	Medium to high -



Impact / risk description	Aspect	Pre-mitigation	Mitigation / closure action	Post-mitigation
Projected temperature increase of 2.2–3.2 °C, rainfall increase of 71–114 mm/annum, 1.1–1.6 additional extreme rainfall days and 28 additional fire-danger days by 2050 degrading cover integrity and vegetation cover.	Increased extreme rainfall and fire danger compromising cover and vegetation performance	High -	Carry the projected rainfall increase (+71 to +114 mm/annum) and the 1.1–1.6 additional extreme rainfall days into the final landform, side-slope, cover and stormwater design; build contingencies for extreme rainfall and very hot days into the emergency response plans and the EMPr; establish and maintain firebreaks and a fire management plan for the rehabilitated cover; monitor cover integrity and vegetation cover after extreme events and re-seed or repair as required; hold re-vegetation and cover repair provision in the post-closure liability.	Medium to high -

2.17 DESIGN PRINCIPLES

2.17.1 LEGISLATIVE AND REGULATORY FRAMEWORK

The environmental requirements pertaining to the planning, operations, and eventual closure of a mine in South Africa were recently - and continue to exist - in a transitional period, as regulation moved from the MPRDA to the NEMA. Although the report is compiled to comply with the requirements of the MPRDA, the legislative context for mine closure is presented in terms of the MPRDA, as well as the NEMA.

2.17.1.1 **MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT**

The following extracts relate to the principle of closure for any mining right issued under the MPRDA:

- Provisions related to financial provision for remediation of environmental damage (recently repealed by the NEMA):
    - Section 41. (1): An applicant for a prospecting right, mining right or mining permit must, before the Minister approves the environmental management plan or environmental management programme in terms of section 39(4), make the prescribed financial provision for the rehabilitation or management of negative environmental impacts.
    - Section 2: If the holder of a prospecting right, mining right or mining permit fails to rehabilitate or manage or is unable to undertake such rehabilitation or to manage any negative impact on the environment, the Minister may, upon written notice to such holder, use all or part of the financial provision contemplated in subsection (1) to rehabilitate or manage the negative environmental impact in question.
    - Section 3: The holder of a prospecting right, mining right or mining permit must annually assess his or her environmental liability and increase his or her financial provision to the satisfaction of the Minister.
    - Section 4: If the Minister is not satisfied with the assessment and financial provision contemplated in this section, the Minister may appoint an independent assessor to conduct the assessment and determine the financial provision.
    - Section 5: The requirement to maintain and retain the financial provision remains in force until the Minister issues a certificate in terms of section 43 to such holder, but the Minister may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of latent or residual environmental impacts.
- Provisions related to the issuing of a closure certificate:
    - Section 43 (1): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the EA and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned.
    - Section 43 (4): An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.
    - Section 43 (5): No closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining to



health and safety and management pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the EA have been addressed.

- Section 43 (7): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, or the person contemplated in sub-section (2) must plan for, manage, and implement such procedures and such requirements on mine closure as may be prescribed.
- Section 43 (8): Procedures and requirements on mine closure as it relates to the compliance of the conditions of an EA, are prescribed in terms of the National Environmental Management Act, 1998.

Prior to 20 November 2015, rehabilitation and closure of mining and associated activities was regulated under the MPRDA. The MPRDA regulations (GNR527; April 2004), prior to being repealed, provided further specific content requirements applicable to mine rehabilitation/closure – with specific reference to the following provisions:

- Regulation 53: Methods for financial provision:
  - Financial provision required in terms of Section 41 of the Act to achieve the total quantum for the rehabilitation, management and remediation of negative environmental impacts must be provided for by one or more of the following methods:
  - An approved contribution to a trust fund as required in terms of Section 10(1)(cH) of the Income Tax Act, 1962 (Act No. 58 of 1962) and must be in the format as approved by the Director-General from time to time;
  - a financial guarantee from a South African registered bank or any other bank or financial institution approved by the Director-General guaranteeing the financial provision relating to the environmental management programme or plan in the format as approved by the Director-General from time to time;
  - a deposit into the account specified by the Director-General in the format as approved by the Director-General from time to time; or
  - any other method as the Director-General may determine.
  - In the case of sub regulation (1)(c), proof of payment must be submitted to the office of the relevant Regional Manager prior to the approval of the environmental management plan or environmental management programme.
- Regulation 54: Quantum of financial provision:
  - The quantum of the financial provision as determined in a guideline document published by the Department from time to time, include a detailed itemization of all actual costs required for-
    - premature closure regarding- (i) the rehabilitation of the surface of the area; (ii) the prevention and management of pollution of the atmosphere; and (iii) the prevention and management of pollution of water and the soil; and (iv) the prevention of leakage of water and minerals between subsurface formations and the surface.
    - decommissioning and final closure of the operation; and
    - post closure management of residual and latent environmental impacts.
  - The holder of a prospecting right, mining right or mining permit must annually update and review the quantum of the financial provision -



- in consultation with a competent person;
- as required in terms of the approved environmental management programme or environmental management plan; or
- as requested by the Minister.

- Any inadequacies with regard to the financial provision must be rectified by the holder of a prospecting right, mining right or mining permit -
  - in an amendment of the environmental management programme or environmental management plan, as the case may be;
  - within the timeframe provided for; or
  - as determined by the Minister.

2.17.1.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

Prior to 8 December 2014, the environmental aspects of mining activities were regulated in terms of the MPRDA. Recent legislative amendments, and the drive towards a 'one environmental system' have resulted in the inclusion of the requirement for rehabilitation, decommissioning and closure planning and associated financial provisions into the NEMA. Specific sections of the act relating to rehabilitation/closure are extracted below:

- Section 24P: Financial provision for remediation of environmental damage:
  - An applicant for an EA relating to prospecting, exploration, mining or production must, before the Minister responsible for mineral resources issues the EA, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.
  - If any holder or any holder of an old order right fails to rehabilitate or to manage any impact on the environment or is unable to undertake such rehabilitation or to manage such impact, the Minister responsible for mineral resources may, upon written notice to such holder, use all or part of the financial provision contemplated in sub-section (1) to rehabilitate or manage the environmental impact in question.
  - Every holder must annually-
    - assess his or her environmental liability in a prescribed manner and must increase his or her financial provision to the satisfaction of the Minister responsible for mineral resources; and
    - submit an audit report to the Minister responsible for mineral resources on the adequacy of the financial provision from an independent auditor.
  - If the Minister responsible for mineral resources is not satisfied with the assessment and financial provision contemplated in this section, the Minister responsible for mineral resources may appoint an independent assessor to conduct the assessment and determine the financial provision.
  - Any cost in respect of such assessment must be borne by the holder in question.
  - The requirement to maintain and retain the financial provision contemplated in this section remains in force notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002 to the holder or owner concerned and the Minister responsible for mineral resources may retain such portion of the financial provision as may be required to rehabilitate the closed



mining or prospecting operation in respect of latent, residual or any other environmental impacts, including the pumping of polluted or extraneous water, for a prescribed period.

- The Insolvency Act, 1936 (Act No. 24 of 1936), does not apply to any form of financial provision contemplated in sub-section (1) and all amounts arising from that provision.
- The Minister, or an MEC in concurrence with the Minister, may in writing make sub-sections (1) to (6) with the changes required by the context applicable to any other application in terms of this Act.

- Section 24 R: Mine closure on EA:
  - Every holder, holder of an old order right and owner of works remain responsible for any environmental liability, pollution or ecological degradation, the pumping and treatment of polluted or extraneous water, the management and sustainable closure thereof notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002, to the holder or owner concerned.
  - When the Minister responsible for mineral resources issues a closure certificate, he or she must return such portion of the financial provision contemplated in Section 24 P as the Minister may deem appropriate to the holder concerned but may retain a portion of such financial provision referred to in sub-section (1) for any latent, residual or any other environmental impact, including the pumping of polluted or extraneous water, for a prescribed period after issuing a closure certificate.
  - Every holder, holder of an old order right or owner of works must plan, manage and implement such procedures and requirements in respect of the closure of a mine as may be prescribed.
  - The Minister may, in consultation with the Minister responsible for mineral resources and by notice in the Gazette, identify areas where mines are interconnected, or their impacts are integrated to such an extent that the interconnection results in a cumulative impact.
  - The Minister may, by notice in the Gazette, publish strategies to facilitate mine closure where mines are interconnected, have an integrated impact or pose a cumulative impact.

2.17.2 OTHER GUIDELINES

The following additional guidelines which relate to financial provisioning and closure have been published in the South African context:

- ICMM, Integrated Mine Closure: A Good Practice Guide (2019). Frames closure planning as an iterative, risk- and opportunity-based process across the life of the asset , closure vision, objectives and measurable success criteria; progressive closure and a closure execution plan; social transition; post-closure monitoring, maintenance and management; residual risk; and relinquishment. These concepts structure Sections 2.17.3 to 2.23 and Section 2.25.
- Best Practice Guideline G5: Water Management Aspects for Mine Closure: This guideline was prepared by the DWS and aims to provide a logical and clear process that can be applied by mines and the competent authorities to enable proper mine closure planning that meets the requirements of the relevant authorities. This guideline is aimed primarily at larger scale mines and does not specifically address closure issues related to closure of exploration activities, however certain principles related to closure and water management are relevant. The following technical factors which should be considered during closure, and those which are likely to relate to exploration activities, have been considered:



- Land use plan: directly interlinked with water management issues insofar as water is required to support the intended land use- in this regard the surrounding communities and the land uses implemented rely on available ground and surface water to be sustained. Management of water quality and quantity has been identified as an aspect to be covered in this FRDCP.
- Public participation and consultation: consultation is fundamental to closure and there is a need for full involvement of stakeholders in the development of the final closure plans, and in the agreement of closure objectives- in this regard this FRDCP has been made available through the EIA public participation process for comment by relevant stakeholders.

- Guideline for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine: The objectives of the guideline include the need to improve the understanding of the financial and legal aspects pertaining to the costing of remediation measures as a result of mining activities. Whilst this guideline predates the recent NEMA Financial Provisioning Regulations, it does contain certain principles and concepts that remain valid and have been considered in this FRDCP.

2.17.2.1 LARSSA - SURFACE REHABILITATION OF COAL MINES GUIDELINE

The Land Rehabilitation Society of South Africa (LARRSA) has recently published a guideline for the surface rehabilitation of coal mines (LaRSSA, 2019). There are aspects of these guidelines which can be applied to the surface rehabilitation actions for most projects and are presented below in Table 29.

Table 29: Key principles for surface land rehabilitation.

Component	Rehabilitation principle
Regulatory compliance	- Achieving legal compliance is a minimum for appropriate rehabilitation planning. - Rehabilitation objectives and associated actions will not conflict with local legislation and will aim to complement and possibly go beyond legal compliance, where possible.
Concurrent implementation	- Concurrent, progressive rehabilitation will be undertaken throughout the operational stage of mining. - A risk-based approach will be applied to ensure concurrently implemented rehabilitation actions will achieve the desired post-mining landscape and land capability aligned with end land use targets.
Stakeholder engagement and custodianship	- Relevant mining-affected stakeholders will be identified and involved in rehabilitation planning throughout the mining lifecycle, as required. - Rehabilitation planning will leverage from local stakeholder views, experiences, cultures and/or customs, on possible uses and needs of the rehabilitated landscape, to foster a land stewardship culture from potential next land users.
Landform Management	- Rehabilitation will be undertaken and aligned to a site-specific surface landform design that will be compiled during the planning stage of an operation. - The site-specific landform design will incorporate the surface profiling needs of the target post-mining land capability and land use/s, to optimize material movement throughout the operational and decommissioning periods, and to ensure the long-term sustainability of the rehabilitated landscape. - A 'management-of-change review process' will be incorporated into the mine planning process, to ensure that changes to the mine plan do not compromise either the proposed final landform or its potential use.



Component	Rehabilitation principle
Land capability	- Post-mining land capability will, as far as is practically possible, be constructed to resemble the pre-mining land capability of the disturbed area. - Attention will be given to rehabilitating the site to specified land capabilities that can support a suite of mixed land uses. - Soil physical and chemical properties will be aligned to the productivity needs of the post-mining land use/s, and to support these in the long-term.
Land use	- Post-mining land use planning will consider the needs of changing regional development and planning, over time. - The site will be left in an environmentally physically safe, stable, and non-polluting condition for the defined post-mining land uses. - The defined post-mining land use/s will provide socio-economic value to next land users, as agreed with these land users (once exact post-mining land uses can be defined).
Climate uncertainty	- Predictive modelling will form the basis for longer-term environmental impact identification and risk management.
Monitoring	- Monitoring will be initiated as soon as the first ground has been moved (at construction). - Monitoring will be continued progressively throughout the project lifecycle, in parallel with concurrent rehabilitation activities. - Data obtained through ongoing monitoring will be frequently assessed for trends that could demonstrate rehabilitation success, and where corrective action may be required. - The monitoring process must be linked to a corrective action process.
Adaptive land management	- An adaptive land management approach will be adopted on-site, allowing for implementation of alternative and improved rehabilitation strategies and corrective action, where required.

2.17.3 CLOSURE, VISION, OBJECTIVES, TARGETS AND CRITERIA

The closure vision is to return the disturbed footprint to a safe, stable, non-polluting and self-sustaining condition that supports the agreed post-mining land use of grazing, that is consistent with the surrounding landscape and land capability, and that can be relinquished without residual active management obligations or an unfunded liability. The objectives, targets and criteria that give effect to the vision are set out in Table 30. Relinquishment criteria are detailed further in Section 2.23.



Table 30: Closure vision, objectives, targets, and criteria.

Closure domain	Objective	Target	Criterion (measurable)
Landform	Establish a stable, free-draining final landform on the Deelkraal II TSF and the reclaimed Deelkraal I and Kusasalethu footprints that sheds water without ponding, does not generate concentrated erosive flow, and requires no ongoing active management after the aftercare period.	Side slopes and top surface shaped, capped and vegetated (or covered with 300 mm fine rock on a levelled, compacted base) and armoured to remain physically stable under the projected post-2050 rainfall regime (+71 to +114 mm/annum and 1.1 to 1.6 additional extreme rainfall days); natural cross-fall and runoff routing re-established; all temporary berms, spoil ridges, access ramps and diversion bunds removed; drainage outlets stabilised (DWS BPG G5).	No rill, gully, scour, undercutting or slumping requiring repair recorded on three consecutive annual inspections and after each design rainfall event; measured erosion on vegetated slopes at or below 100 t/ha/yr (against approximately 500 t/ha/yr uncontrolled, Blight 1989); survey beacon and piezometer records show no movement, settlement or phreatic surface rise outside the design envelope over three consecutive years; no ponding on the top surface and no erosion or sedimentation at any discharge point.
Soils and land capability	Return the rehabilitated footprints , in particular the 256.83 ha of previously transformed land and the vacated Deelkraal I and Kusasalethu footprints , to a soil condition able to support the agreed post-mining land use, recognising that the approximately 430 ha facility footprint cannot be returned to its pre-mining land capability.	Compacted surfaces ripped or scarified before soil replacement; salvaged topsoil re-spread to approximately 300 mm across all rehabilitated areas in accordance with the Topsoil Salvage and Stockpiling Plan (topsoil stripped to the A horizon / 300 mm, subsoil to 1 000 mm, horizons kept separate, stockpiles limited to 2.0 m and located outside wetlands and buffers); topsoil reapplied after final shaping and before the onset of the first summer rains; land capability restored to at least the Low to Moderate grazing capability of the surrounding Fb15 land type.	Replaced topsoil depth of at least 250 mm confirmed on a sampling grid across each rehabilitation domain; no mixing of soil horizons or contamination recorded in the soil handling register; bulk density and penetration resistance to 300 mm within the range measured at undisturbed Fb15 analogue sites; grazing land capability confirmed by an independent soil scientist over two consecutive growing seasons; no topsoil stockpile remaining on site at sign-off.
Surface water and drainage	Reinstate natural drainage across the rehabilitated footprint and hand the site over to passive drainage that is non-polluting, does not require active water management, and does not	Clean and dirty water separation, the return water dam and the dirty water containment system decommissioned only once runoff quality complies with the closure water-quality criteria; natural cross-fall, drainage connectivity	Runoff and downstream surface water quality at the agreed upstream and downstream monitoring points comply with the water use licence limits and the receiving water objectives for the Varkenslaagte / Wonderfontein (C23E)

Closure domain	Objective	Target	Criterion (measurable)
	export sediment to the receiving wetlands and watercourses.	and diffuse flow re-established with no artificial ponding, bypass erosion, incision or blocked flow paths; temporary sediment controls retained until disturbed surfaces are demonstrably stable.	and Loop Spruit (C23J) systems over eight consecutive quarterly rounds; no artificial ponding, concentrated uncontrolled discharge, scouring or blocked flow path recorded on two consecutive post-rainfall inspections; no measurable sediment deposition attributable to the project recorded at any wetland edge.
Groundwater	Ensure that residual seepage from the rehabilitated Deelkraal II TSF and return water dam does not impact down-gradient receptors, and that the existing Deelkraal and Kusasalethu plumes attenuate following removal of the tailings source.	Cover and capping limit infiltration and pyrite oxidation in the unsaturated zone so that seepage remains within the design rate (approximately 140 ℓ/ha/day for the Class C barrier; approximately 6 ℓ/ha/day for an inverted barrier); measured plume position and concentration match the calibrated FEFLOW prediction; no down-gradient receptor impacted within the 50-year simulation period; the existing plumes attenuate to below licence limits over approximately 50 years.	Sulphate, TDS, EC and manganese at all down-gradient monitoring boreholes , a minimum of two shallow / deep pairs north and two south of the Deelkraal II TSF, together with the existing DK BH TSF S/D and the Kusasalethu BH8, BH9 and MBH16 network , show a stable or declining trend over five consecutive years and no exceedance of the water use licence limits at the property boundary; no hydrocensus borehole exceeds SANS 241:2015 as a result of the project; no deviation from the modelled plume position of a magnitude that would trigger cut-off trench or equivalent contingency remediation.
Biodiversity and vegetation	Re-establish a persistent, self-sustaining indigenous vegetation cover appropriate to the receiving habitat, reinstate the function of the retained wetland systems (HGM 3, HGM 5 and HGM 6 and the associated drainage and buffer areas), and bring alien invasive plants under demonstrable control.	Rehabilitated surfaces ripped, topsoiled and revegetated at the onset of the rainy season using locally indigenous, habitat-appropriate seed mixes , Carletonville Dolomite Grassland species; bushveld species adjoining Rocky Gauteng Shale Mountain Bushveld; hygrophilous species for authorised wetland edge and seep rehabilitation; and pioneer species for degraded surfaces; NEMBA Category 1b and Category 2 species controlled by lawful, species-appropriate methods with sustained	Basal vegetation cover of at least 70% with bare ground not exceeding 10%, achieved by the end of the second full growing season and sustained over two consecutive annual assessments, verified by fixed-point photography and quadrat sampling; at least 60% of recorded species indigenous to the target vegetation type; alien invasive cover below 5% with no seed-setting individuals and no expanding stands at sign-off (no rehabilitation area to be signed off while invasive species are seeding freely or increasing



Closure domain	Objective	Target	Criterion (measurable)
		follow-up; wetland Present Ecological State improved toward the Recommended Ecological Category (E/F , improve; C/D , improve).	in cover); wetland PES improved by at least one category at each rehabilitated HGM unit, confirmed by a freshwater specialist.
Safety, access and residual structures	Leave the site in a condition that is safe, stable and manageable for the post-closure land user, with all redundant infrastructure removed and no residual physical hazard. (The project creates no final voids; the residual structures are the rehabilitated TSF landform and the decommissioned return water dam.)	All redundant surface infrastructure , plant upgrades, pump stations, slurry and water pipelines, powerlines, laydown areas and the return water dam , dismantled and removed; concrete and reinforced concrete demolished to 1 m below final surface level; demolition waste classified and disposed of at licensed facilities; access to the rehabilitated landform and any residual water body controlled until the stability and vegetation criteria are met; long-term stability monitoring established under the GISTM and continuing post-closure.	All redundant infrastructure removed and safe-disposal certificates retained for every hazardous and general waste stream; no open excavation, unfenced steep face, unstable structure or unrehabilitated temporary work area remaining at handover, verified against the close-out checklist for each area; GISTM stability monitoring in place with no unresolved corrective action and no overdue item on the non-conformance register; road damage attributable to the project repaired and private accesses reinstated or formally closed to the satisfaction of SANRAL, GDRT and Merafong City Local Municipality.
Post-closure land use and social transition	Hand over a landscape that supports the agreed post-mining land use, and a workforce and host community that have been prepared for closure and whose livelihoods have been restored.	Post-mining land use agreed with the competent authority, affected landowners and occupiers and recorded per rehabilitation domain , grazing on the rehabilitated transformed land and on the vacated Deelkraal I and Kusasalethu footprints, and an alternative use for the facility footprint that the rehabilitated capability can support (for example renewable energy generation on the degraded landform); livelihood restoration for informal occupiers completed in line with IFC PS5 irrespective of tenure status; closure and social transition planning implemented in accordance with SIMP item 15.	Signed post-closure land use plan covering every rehabilitation domain; alternative grazing land secured and in use before access to the footprint is lost, confirmed over two consecutive livelihood monitoring rounds; retrenchment procedures, portable-skills training and local rehabilitation employment evidenced in the closure and social transition records; no unresolved closure-related grievance on the grievance register at sign-off; written confirmation obtained from each relevant department in terms of section 43(5) of the MPRDA in support of the closure certificate application.

2.17.4 ALTERNATIVE CLOSURE AND POST-CLOSURE OPTIONS

The Harmony West Wits Reclamation Project encompasses closure and rehabilitation of the Deelkraal II Tailings Storage Facility (TSF), associated processing and utility infrastructure, and access corridor networks. The closure planning process considered multiple design alternatives across six major decision domains: (1) location and footprint; (2) TSF design geometry; (3) liner systems; (4) pipeline routing and design; (5) tailings deposition methods; and (6) process alternatives. Each alternative is evaluated against risk classification, technical feasibility, cost-effectiveness, long-term maintenance burden, and post-mining land-use compatibility.

2.17.4.1 **LOCATION AND FOOTPRINT ALTERNATIVES**

- Deelkraal II TSF (Selected): Optimal geotechnical settings; enables gravity-driven drainage; integrated with existing operational infrastructure;
- Old Savuka Footprint (Rejected): Insufficient space; geometric constraints; higher unit cost;
- Old DF5 Footprint (Rejected): Space limitations; subsurface conflicts; geotechnical constraints; and
- No-Go Alternative (Not Considered Reasonable): Exceeds existing facility capacities; violates NEMA licensing.

2.17.4.2 **TSF DESIGN ALTERNATIVES**

Three-compartment Deelkraal II configuration optimizes storage efficiency (192.35 Mt capacity at 65 m maximum height) while maintaining slope stability (1V:2.5H final slopes). Staged closure enables early rehabilitation of completed compartments during operational phase. Height/footprint trade-off analysis confirms selected design balances capital cost against long-term maintenance burden. Phased deposition (20-year operational period) enables progressive consolidation and reduces closure-phase slope instability risk.

2.17.4.3 **LINER SYSTEM ALTERNATIVES**

- Lined TSF with Class C Inverted Barrier (Selected): Substantially reduces the seepage area and rate; supports closure water quality compliance; reduces long-term liability;
- Unlined TSF (Rejected): Creates persistent contamination plume (50–100+ years); requires perpetual groundwater treatment; incompatible with financial provisioning assumptions; restricts post-closure land use; and
- The EIA specialist team concluded: 'Based on the significant benefits as a result of lining the TSF the lined option is preferred.

2.17.4.4 **PIPELINE ROUTING AND DESIGN ALTERNATIVES**

- Above-Ground Pipeline Design (Selected): Enables visual inspection without excavation; facilities maintenance; flexible decommissioning; compatible with closure-phase water management;
- Below-Ground Pipelines (Rejected): Creates subsurface contamination risk; complicates post-closure decommissioning; incompatible with closure objectives;
- Corridor 1 Southern Route (Selected): Lower environmental impact on wetland/biodiversity; enables gravity-driven drainage; optimal infrastructure aggregation;
- EIA specialist conclusion: 'Above-ground pipelines are the more favourable designs' based on technical feasibility and closure compatibility.;

2.17.4.5 **AILINGS DEPOSITION METHOD ALTERNATIVES**

- Cyclone Deposition (Selected): Proven technology at site; produces favourable density stratification; cost-effective; compatible with slope stabilization;



- Spigot, Paddock, and Dry Stacking Alternatives (Rejected): Higher capital cost; operational complexity; extended timeline; cost-prohibitive energy demand (dry stacking); and
- EIA specialist conclusion: 'Conventional Disposal Methods (specifically Cyclone Deposition) are preferable over the available Alternative Tailings Disposal methods.

2.17.4.6 **PROCESS ALTERNATIVES**

- Wet Stacking (Selected): Compatible with existing hydrometallurgical process; standard industry practice; enables water recycling (~60% recovery); capital cost minimization; and
- Dry Process and No-TSF Alternatives (Rejected): Require process redesign (R50+ million investment); operationally incompatible; economically unviable.

2.17.5 MOTIVATION FOR THE PREFERRED CLOSURE OPTIONS

- The preferred closure options represent the outcome of systematic risk-based evaluation across technical feasibility, cost-effectiveness, long-term maintenance burden, and post-mining land-use compatibility.

2.17.5.1 **DEELKRAAL II LOCATION SELECTION RATIONALE**

- Geotechnical Optimality: Foundation bearing capacity >250 kPa; expected settlement <50 mm; no subsidence risk
- Gravity Drainage Integration: Eliminates need for expensive pumping infrastructure during closure phase
- Wetland and Biodiversity Buffer: Includes regulatory buffer zones; minimizes offset obligations
- Infrastructure Network Aggregation: Aligns with existing operational facilities; enables coordinated closure management

2.17.5.2 **CLASS C INVERTED BARRIER (LINED TSF) SYSTEM RATIONALE**

- Residual Environmental Risk Minimization: Substantially reduces long-term seepage; groundwater quality is not expected to return to baseline within the aftercare period (Section 2.17.6.4)
- Post-Closure Land-Use Compatibility: Supports the agreed post-mining land use of grazing (Section 2.18); any residual use restrictions associated with the existing contamination plumes will be defined through the groundwater monitoring programme (Section 2.25)
- International Best Practice Alignment: ICMM GISTM, IFC Performance Standards recommend liner systems for tropical climates and proximity to sensitive water resources

2.17.5.3 **CYCLONE DEPOSITION METHOD RATIONALE**

- Operational Simplicity: Established method at Harmony facilities; staff familiarity; proven performance over 15+ years
- Cost-Effectiveness: established at Harmony's operations, avoiding the capital cost of an alternative deposition system
- Geotechnical Performance: Produces favorable density stratification; improves slope stability during and after deposition
- Water Management Simplification: Predictable seepage and water recovery (~60%); enables closed-loop recirculation



2.17.5.4 ABOVE-GROUND PIPELINE DESIGN RATIONALE

- Operational Maintainability: Visual inspection at routine intervals without soil excavation; early failure detection
- Closure-Phase Integration: Remains operational through aftercare period; enables flexible decommissioning strategy
- Environmental Risk Minimization: Eliminates subsurface contamination pathway; enables rapid environmental response if leakage occurs
- Post-Closure Land-Use Flexibility: Can remain in place or be systematically decommissioned without soil remediation

2.17.5.5 WET STACKING PROCESS RATIONALE

- Hydrometallurgical Process Integration: No process redesign required; operational staff familiarity; proven performance
- Closure Water Management: Enables integrated water quality management; establishment of treatment methods over operational/closure transition
- Long-Term Cost Predictability: Closure costs quantifiable; quantified in Section 2.24
- Risk Class A Compliance: Provides defensible closure strategy; supports liability transfer at end of defined aftercare period

2.17.6 CLOSURE AND POST-CLOSURE PERIOD

Closure period is structured in phases reflecting the transition from operational tailings deposition to closure completion and long-term stewardship. Total closure period estimated at 50+ years (2028–2080+) spanning operational phase, active closure, intensive aftercare, extended monitoring, and long-term stewardship.

The EMPr (Table 8) describes four phases: planning (pre-commencement); progressive rehabilitation of the TSF (about 8 years); decommissioning and rehabilitation (1 to 3 years); and closure and post-closure (about 50 to 100 years, or until a closure certificate is received). It commits to maintenance of the vegetated TSF over three years and quarterly monitoring, by analysing samples for pollutants, over five years once vegetation is established; to an update of the numerical groundwater model every three years; and to applying for the authorisations and licences needed for closure, preferably 18 months before scheduled closure. The phases below are to be read with these commitments.

2.17.6.1 OPERATIONAL PHASE (2028–2048, 20 YEARS)

- Continuous tailings deposition: 192.35 Mt total capacity; cyclone-fed slurry pipeline network
- Staged compartment filling: Compartments 1 & 2 (20-year period); Compartment 3 (13-year period)
- Routine geotechnical monitoring: Settlement surveys, piezometer readings (biannual frequency)
- Pre-closure erosion control and vegetation trials: Years 10–15 to establish cover propagation protocols

2.17.6.2 ACTIVE CLOSURE PHASE (2048–2051, 2–3 YEARS)

- Cover system installation: Class C inverted barrier on all compartments; slope profiling and stabilization
- Erosion control measures: Rip-rap toe protection, geotextile matting, slope drains
- Vegetation establishment: Native grasses and legumes; target 80% ground coverage by end of year 2
- Water treatment system commissioning: Closure water treatment (lime neutralization, settling)



2.17.6.3 INTENSIVE AFTERCARE PHASE (2051–2056, 5–7 YEARS NOMINAL)

- Vegetation maintenance and erosion control: Supplementary seeding, weed management, watering
- Geotechnical aftercare: Settlement surveys (quarterly), piezometer monitoring (monthly declining to quarterly)
- Hydrological aftercare: Active water treatment, seepage monitoring, surface water quality compliance verification
- Environmental monitoring: Biodiversity assessment, wetland condition monitoring, groundwater quality baseline confirmation

2.17.6.4 EXTENDED AFTERCARE AND LONG-TERM MONITORING (2056–2080+, 25+ YEARS)

- Reduced-frequency monitoring: Annual to biennial geotechnical/hydrological surveys; long-term ecosystem recovery tracking
- Long-term groundwater monitoring: Annual piezometer sampling (simplified analytical suite); contingency protocol if contamination detected
- Long-term biodiversity stewardship: Periodic ecological monitoring (5–10 year intervals) to document wetland recovery trajectory

2.17.6.5 CLOSURE COMPLETION CRITERIA

- Cover system stable and vegetation self-sustaining; settlement rates asymptotic to zero (<5 mm/year)
- Pore pressures at equilibrium; closure water quality compliance demonstrated (12+ quarters)
- Groundwater unimpacted by TSF seepage; baseline water quality maintained (8+ quarters)

2.17.7 ASSUMPTIONS AND ONGOING CLOSURE RESEARCH

The closure plan is predicated on faithful implementation of operational mitigation measures, successful construction to specifications, predictable geotechnical/hydrological behavior, and post-closure land use compatible with defined monitoring obligations.

2.17.7.1 KEY CLOSURE PLAN ASSUMPTIONS

- Capital investment completed on schedule by 2028; all mitigation measures prescribed in EIA implemented faithfully
- TSF construction executed to engineering specifications with <0.1% geomembrane installation defect rate; QA/QC inspections during all critical phases
- Closure water quality managed through conventional lime treatment; compliance to be demonstrated within the aftercare period (Section 2.17.6.3); groundwater quality is not expected to return to baseline within that period
- Native vegetation successfully established on TSF slopes; 80% ground coverage target achievable through conventional seeding/planting protocols

2.17.7.2 POST-CLOSURE LAND USE COMPATIBLE WITH ENVIRONMENTAL MONITORING; TSF REMAINS UNDER

- Key Uncertainties and Mitigation Strategies
- Foundation settlement prediction (±25% uncertainty): Mitigated by expanded geotechnical survey (12–16 additional boreholes) and real-time monitoring



- Long-term slope stability (pore pressure dissipation timescale): Mitigated by extended piezometer monitoring and slope inclinometer surveillance
- Acid generation and closure water chemistry (kinetic testing uncertainty): Mitigated by extended kinetic testing (1–2 years) and pilot water treatment trials
- Seepage pathway and groundwater impacts (3D flow heterogeneity): Mitigated by expanded monitoring well network (8–12 no. perimeter wells) and contingency active treatment capability
- Vegetation establishment (species and climate variability): Mitigated by pre-closure trials (years 12–15), adaptive species selection, and supplementary irrigation capability
- Wetland ecosystem recovery trajectory (long-term recovery rate uncertainty): Mitigated by baseline biodiversity surveys, post-closure monitoring at 5-year intervals, and adaptive rehabilitation measures

2.17.7.3 **ONGOING RESEARCH PROGRAM**

- Geotechnical: Expanded foundation investigation, slope stability modeling (3D FE analysis), settlement prediction refinement
- Hydrological/Geochemical: Extended kinetic testing (12–24 months), 3D groundwater flow modeling, pilot water treatment trials
- Vegetation: Native species selection trials (large-scale plots), soil bioengineering protocols, mycorrhizal association assessment
- 1.1.4.4 Contingency Management and Adaptive Protocols
- Trigger events defined for adaptive management: Geotechnical anomalies (settlement >25% of prediction, differential settlement >15 mm)
- Hydrological anomalies (seepage >50% of prediction, groundwater pH <5.5, contamination plume detection)
- Vegetation failures (<50% coverage by year 2, erosion rilling, alien species invasion)
- Contingency cost allocation: to be quantified at the annual review for adaptive remediation if field conditions diverge from predictions

Upon completion of intensive aftercare (year 7–10 post-closure), formal closure completion is achieved when all closure criteria are demonstrated and residual environmental risk is contained within predictable, monitorable parameters. Liability transfer to post-mining land owner/steward is targeted for this completion point. Long-term monitoring and stewardship responsibilities continue on extended schedule (annual to biennial frequency) through year 50+ post-closure.

2.18 FINAL POST-CLOSURE LAND USE

The proposed post-mining land use is free-range livestock grazing, consistent with the pre-mining land capability of land type Fb15 and with the surrounding land use, which the agro-ecosystem assessment records as informal free-range grazing with subsistence cultivation and no formal cultivation in the past five years. Of the 645.79 ha development footprint, 256.83 ha (39.8%) is already transformed by the existing tailings storage facilities and mine dumps and carries negligible capability; 120.52 ha is of Low sensitivity (shallow Glenrosa and Mispah lithosols) and 268.44 ha of Moderate sensitivity (Avalon mAv26 with Hutton Hu26 and Shortlands Sd11). No observation point returned a High agricultural potential, and the DFFE Screening Tool “High” agriculture sensitivity was disputed and verified as Medium. Grazing is therefore feasible on all rehabilitated areas other than the Deelkraal II TSF landform itself, and is supported by the reclamation of the dormant Deelkraal I and Kusasalethu footprints, which returns previously sterilised land to productive use. The approximately 430 ha occupied by the Deelkraal II TSF is permanently removed from agricultural use; a differentiated land use is



therefore proposed for that domain. Land uses differ across the rehabilitation domains as set out in Table 31, and each is to be confirmed with the competent authority, the affected landowners and the occupiers of the land before closure.

Table 31: Post-mining land use by rehabilitation domain.

Rehabilitation domain	Post-mining land use	Supporting land capability
Deelkraal II TSF final landform (approximately 430 ha in three compartments, to a maximum height of 65 m)	Non-agricultural. Vegetated, conservation-managed landform maintained for stability and dust control, with a potential secondary use as a renewable energy generation platform (the climate change assessment identifies use of the degraded land for renewables in preference to greenfield land). Grazing on the capped surface to be considered only if the outstanding Radiological Impact Assessment and demonstrated cover performance confirm it is safe.	None, permanently transformed. The capped surface supports a self-sustaining indigenous grass cover for erosion and dust control only; the pre-mining Moderate capability (Avalon, Hutton and Shortlands) of the footprint is irreversibly lost and cannot be restored by mitigation.
Reclaimed dormant TSF footprints, Deelkraal I and Kusasalethu	Free-range livestock grazing, returned to the surrounding informal grazing system; alternatively incorporated into the renewable energy platform where grid access and stability permit.	Restored Low grazing capability. Non-arable. Footprint stripped of residual tailings and contaminated material, ripped, topsoiled to approximately 300 mm and revegetated with indigenous grassland species; capability is created where none existed, as these footprints currently carry a Transformed / negligible rating.
Return water dams (main RWD approximately 13 ha; RWD2 and RWD3 approximately 3 ha combined) and pump station footprints (approximately 4 ha combined)	Free-range livestock grazing, following draining of the dam, removal of the liner, embankments and pumping infrastructure, and shaping of the footprint to the natural contour with no residual impoundment.	Restored Low grazing capability. Non-arable. Free-draining, with reinstated cross-fall to the natural drainage alignment; no standing water to be retained as an attractive nuisance or stock-watering point unless water quality complies with the closure criteria.
Temporary works areas , topsoil stockpiles (approximately 65 ha) and construction laydown areas (approximately 35 ha)	Free-range livestock grazing, returned to the pre-project land use. Stockpiles are consumed during progressive rehabilitation and the platforms decommissioned, decompacted and revegetated as each area falls out of use.	Moderate where the area overlies Avalon mAv26, Hutton Hu26 or Shortlands Sd11; Low on Glenrosa and Mispah lithosols. Full pre-project capability recoverable once compacted surfaces are ripped and the soil profile reinstated, as these areas are not permanently occupied. Kusasalethu reclamation laydown Option 2 is preferred so that



Rehabilitation domain	Post-mining land use	Supporting land capability
		negligible-potential rather than low-potential soil is committed.
Linear servitudes , slurry pipelines (approximately 30 km) and process and potable water pipelines (approximately 25 km) in 4 m servitudes, and the overhead powerlines (approximately 18 km)	Free-range livestock grazing and, where a servitude crosses land in another use, return to that pre-existing use. Pipelines, plinths, conductors and tower structures removed at decommissioning and the servitudes and access tracks rehabilitated.	Full pre-project capability , Moderate on mAv26, Hu26 and Sd11, Low on Glenrosa and Mispah. Disturbance is shallow and linear: pipelines are carried above ground on pre-cast plinths with shallow footings, and powerline disturbance is confined to tower footings and access, so the soil profile is recoverable by subsoiling and topsoil replacement.
Access and haul roads (approximately 15 km of new 7.5 m wide access roads)	Roads required by the post-closure land user retained by written agreement with the landowner and the relevant road authority; all redundant roads and private accesses onto the provincial network rehabilitated or formally closed, and returned to free-range grazing.	Restored Low to Moderate grazing capability, depending on the underlying soil form. Gravel wearing course and yard stone to be removed before soil replacement, and the road prism ripped to at least 300 mm to re-establish infiltration and root penetration.
Kusasalethu gold plant upgrades and reclamation infrastructure footprint	Retained industrial use if the plant continues to operate under a separate authorisation; otherwise demolished, remediated and returned to free-range livestock grazing.	Transformed / negligible at present. Restored Low grazing capability once hardstand, foundations (demolished to 1 m below final surface level) and hydrocarbon- or chemically contaminated soil are removed and the footprint topsoiled and revegetated.
Retained and rehabilitated wetlands, drainage features and buffers , HGM 3, HGM 5, HGM 6 and the associated non-perennial drainage, with 25 m wetland and 15 m drainage buffers	Conservation and ecological support. No cultivation, infrastructure, stockpiling or vehicle access; controlled livestock watering access only where it does not compromise the Present Ecological State. Managed to improve the PES toward the Recommended Ecological Category.	Wetland , non-arable. Capability is defined by hydrological and ecological function rather than an agricultural class. Hydric and wetland-associated soils to be replaced in sequence and diffuse surface flow and shallow subsurface connectivity reinstated.
No-go conservation areas , High SEI rocky habitat, Class 1 Ridges and the 200 m buffer for high-impact development	Conservation. These areas remain undisturbed throughout the life of the project and are excluded from the post-mining land use change; they carry no closure land use obligation beyond continued	Low / non-arable , shallow Glenrosa and Mispah lithosols with rock outcrop, which make up 57.3% of land type Fb15. Value is ecological rather than agricultural;

Rehabilitation domain	Post-mining land use	Supporting land capability
	protection and alien invasive plant control.	the habitat is non-resilient and could not be re-created if lost.

2.19 CLOSURE ACTIONS

The closure actions required to achieve the closure objectives and relinquishment criteria are set out in Table 32, by area and/or infrastructure and the applicable life-of-mine phase (decommissioning / closure and rehabilitation). Detailed sub-plans support the actions where required, for example a residue-facility cover design, topsoil stripping / stockpiling / placement plan, revegetation plan, watercourse / wetland rehabilitation plan, materials balance and final-landform design, and a stormwater / water-management plan.

Infrastructure that contained, or is contaminated with, radionuclides will be decommissioned under a decommissioning plan approved by the National Nuclear Regulator (NNR), as committed in the EMPr and described in the EIA Report (Rev. 1). The TSF itself remains in place in perpetuity, so clean-up is limited to areas outside the TSF footprint that may have become contaminated during operations; demolition, decontamination and clearance of those areas are demonstrated by a gamma radiation survey supplemented by full-spectrum analysis of soil samples. Certain access roads may be retained as smaller local roads for controlled access during closure and for post-closure monitoring and maintenance.

Table 32: Closure actions by domain and phase.

Area / infrastructure	Closure action	Method / standard	Phase	Responsibility
Deelkraal II TSF	Progressive shaping and grassing of completed side slopes as each compartment reaches final height.	Deposition to the design profile; incremental rehabilitation so the slopes blend with the surrounding landform. The AQIA mitigated rating assumes 80% wind-erosion control from grassed side slopes.	Concurrent	Rehabilitation Contractor / Mine Environmental Representative
Deelkraal II TSF	Cease deposition and dewater the tailings mass.	Underdrainage maintained and all recovered seepage returned to the process circuit until porewater quality stabilises.	Decommissioning	Mine Environmental Representative
Deelkraal II TSF	Final shaping and capping of the top surface and side slopes.	Final-landform design: free-draining, erosion-resistant, no ponding (DWS BPG G5); rounded rather than terraced profile; 300 mm fine rock cover on a levelled, compacted base (90–100% wind-erosion control) where sustaining vegetation cannot be established.	Closure	Applicant / Proponent with geotechnical designer
Deelkraal II TSF	Topsoil placement and revegetation of the capped landform.	Rip or scarify; replace topsoil to approximately 300 mm; seed with indigenous grassland species at the onset of the rainy season; rework and re-seed areas failing to establish by the end of the first full growing season.	Closure	Rehabilitation Contractor
Deelkraal II TSF	Long-term stability monitoring of the final landform.	GISTM: survey beacons, piezometers and scheduled inspections with defined corrective-action triggers; dam-break analysis maintained current; repair and maintenance provision held in the ERA liability.	Post-closure	Applicant / Proponent with geotechnical specialist
Dormant TSFs , Deelkraal I and Kusasalethu	Hydraulic reclamation of the dormant facilities.	Progressive removal of the tailings source as reclamation advances, with the vacated footprint rehabilitated as each area is released.	Concurrent	Applicant / Proponent



Area / infrastructure	Closure action	Method / standard	Phase	Responsibility
Dormant TSFs , Deelkraal I and Kusasalethu	Remove reclamation infrastructure, monitor guns, sumps and return lines.	Dismantle and remove; strip and dispose of hydrocarbon-contaminated material at a licensed facility.	Decommissioning	Rehabilitation Contractor
Dormant TSFs , Deelkraal I and Kusasalethu	Rehabilitate the vacated footprints.	Strip residual tailings and contaminated footprint material; rip to at least 300 mm; replace topsoil to approximately 300 mm; revegetate with indigenous grassland species so the exposed footprint does not become a replacement dust source.	Closure	Rehabilitation Contractor / Mine Environmental Representative
Return water dam, pump stations and pipelines	Flush, drain, dismantle and remove the return water system, pump stations and slurry and water pipelines.	Flush and drain all pipelines and vessels to the process circuit before dismantling; work over drip trays within bunded areas; demolish concrete and reinforced concrete to 1 m below final surface level; remove pre-cast plinths, pipe and steel for recycling.	Decommissioning	Rehabilitation Contractor
Return water dam, pump stations and pipelines	Rehabilitate the RWD, pump station and pipeline servitude footprints.	Shape TSF to the natural contour with no residual impoundment and reinstated cross-fall; rip, topsoil and revegetate the 4 m servitudes and the dam and pump station footprints.	Closure	Rehabilitation Contractor
Overhead powerline	Remove conductors, towers and footings and rehabilitate the servitude.	Remove structures and footings; rip access tracks; replace topsoil and revegetate; remove any fencing or barrier to faunal movement.	Decommissioning	Rehabilitation Contractor
Access and haul roads	Rehabilitate or formally close redundant access and haul roads and private accesses.	Remove gravel wearing course and yard stone before soil replacement; rip the road prism to at least 300 mm; topsoil and revegetate. Repair road damage attributable to the project and reinstate or formally close private accesses onto the provincial network, subject to SANRAL and GDRT approval.	Closure	Applicant / Proponent



Area / infrastructure	Closure action	Method / standard	Phase	Responsibility
Kusasalethu gold plant upgrades	Demolish and remediate the plant upgrade footprint where it is not retained under a separate authorisation.	Dismantle plant and structures; demolish foundations to 1 m below final surface level; remove hardstand, yard stone and hydrocarbon- or chemically contaminated soil to a licensed facility.	Decommissioning	Rehabilitation Contractor
Temporary works areas , laydowns, stockpiles and contractors' camps	Decommission and close out each temporary area as it falls out of use.	Clear waste and materials; remove all foreign material; rip compacted surfaces; regrade to match surrounding contours; topsoil and revegetate. Inspect at decommissioning of each area and monthly until stable.	Concurrent	Rehabilitation Contractor / Environmental Control Officer
Soils and land capability	Salvage, stockpile and protect topsoil.	Strip only within approved areas and only to the depth of the A horizon (300 mm topsoil, subsoil to 1 000 mm); keep horizons and habitat-specific soils separate; stockpiles limited to 2.0 m, located outside wetlands, drainage features and buffers, bermed, runoff-diverted and access-restricted.	Concurrent	Rehabilitation Contractor / Environmental Control Officer
Soils and land capability	Decompact and replace soil on all rehabilitated areas.	Rip or scarify compacted surfaces before topsoil replacement to promote infiltration and root penetration; reapply topsoil after final shaping and before the onset of the first summer rains.	Closure	Rehabilitation Contractor
Soils and land capability	Verify restored land capability against the relinquishment criteria.	Independent soil scientist confirms grazing land capability over two consecutive growing seasons; bulk density and penetration resistance to 300 mm compared against undisturbed Fb15 analogue sites.	Post-closure	Applicant / Proponent with soil scientist
Surface water and drainage	Install and maintain erosion and sediment controls across all disturbed areas.	Site-specific erosion management plan; cut-off drains, contour berms, silt traps, sediment barriers and check structures upslope and downslope of active areas; stockpile protection; repair rills, scour, undercutting and slumping as soon as identified, and redesign rather than repeatedly patch recurring erosion.	Concurrent	Rehabilitation Contractor / Environmental Control Officer



Area / infrastructure	Closure action	Method / standard	Phase	Responsibility
Surface water and drainage	Reinstate natural drainage and remove temporary obstructions.	Remove temporary berms, spoil ridges, access ramps and diversion bunds; re-establish natural cross-fall and runoff routing; stabilise drainage outlets; do not convert diffuse seepage or shallow wetland edge flow into incised channels.	Closure	Rehabilitation Contractor
Surface water and drainage	Decommission the clean and dirty water separation and containment system.	Removed only once runoff quality complies with the closure water-quality criteria and all contact-water sources have been removed.	Closure	Mine Environmental Representative
Surface water and drainage	Monitor surface water quality and drainage performance.	Quarterly sampling at the agreed upstream and downstream points against the water use licence limits and the receiving water objectives for catchments C23E and C23J, with defined corrective-action triggers.	Post-closure	Applicant / Proponent
Groundwater	Establish and operate the groundwater monitoring network.	A minimum of two shallow / deep borehole pairs north and two south of the Deelkraal II TSF, together with the existing DK BH TSF S/D and the Kusasalethu BH8, BH9 and MBH16 network; quarterly sampling for sulphate, TDS, EC and manganese.	Concurrent and post-closure	Mine Environmental Representative with geohydrologist
Groundwater	Verify and update the numerical groundwater model.	The FEFLOW flow and mass-transport model is to be updated whenever any deviation from the predicted contaminant migration is observed, and the modelling findings verified through operation, decommissioning and post-closure.	Post-closure	Applicant / Proponent with geohydrologist
Groundwater	Implement contingency remediation of contaminant migration.	Cut-off trenches or an equivalent containment option, implemented on trigger; the cost is a contingent closure liability to be provided for in the ERA.	Post-closure	Applicant / Proponent
Biodiversity , terrestrial	Demarcate the approved footprint, buffers and no-go areas, and complete the pre-clearance walkdown and permitting.	Peg the approved disturbance footprint before clearance; demarcate 25 m wetland and 15 m non-perennial drainage buffers (or stricter authority-imposed buffers); flag rocky habitat, Class 1 Ridges and protected flora as no-go; wet-season (October–March) walkdown of High SEI areas; protected-species relocation or destruction permits	Concurrent	Applicant / Proponent with terrestrial ecologist; Environmental Control Officer



Area / infrastructure	Closure action	Method / standard	Phase	Responsibility
		from GDARDE before any clearing; maintain and replace damaged markers.		
Biodiversity , terrestrial	Implement alien invasive plant control.	AIP management programme covering all active and rehabilitated areas, stockpiles, drainage lines, disturbed edges and haul routes; NEMBA Category 1b and Category 2 species controlled by lawful, species-appropriate methods; clear before seed set; treat contaminated topsoil before re-use; follow-up until re-invasion is under control. No area to be signed off while invasives are seeding freely or expanding in cover.	Concurrent and post-closure	Rehabilitation Contractor with terrestrial specialist
Biodiversity , terrestrial	Revegetate all rehabilitated surfaces.	Habitat-appropriate locally indigenous seed mixes , Carletonville Dolomite Grassland species; bushveld species adjoining Rocky Gauteng Shale Mountain Bushveld; hygrophilous species for wetland edges; pioneer species for degraded surfaces. Mulch, brush-packing and rock placement to aid establishment; timed to the onset of the rainy season; no fertiliser or ameliorant in wetlands or sensitive drainage areas.	Closure	Rehabilitation Contractor
Biodiversity , wetlands and drainage	Rehabilitate disturbed wetland margins, seeps, drainage features and buffers.	Re-profile disturbed wetland and seep margins to the pre-disturbance level and slope, replacing subsoil and topsoil in the correct sequence; remove redundant fill, berms and obstructions to inflow, outflow and lateral connectivity; reinstate diffuse surface flow; revegetate with locally indigenous, moisture-appropriate species; control the sediment source before treating any accumulation.	Closure	Rehabilitation Contractor with freshwater specialist
Waste and contamination	Classify, segregate and dispose of demolition and hazardous waste.	Demolition waste management plan prepared before works; classification in terms of the NEMWA and the Waste Classification and Management Regulations; segregation at source with re-use and recycling of scrap steel, concrete and yard stone; bunded, covered hazardous waste storage; licensed disposal with safe-disposal certificates retained.	Decommissioning	Rehabilitation Contractor



Area / infrastructure	Closure action	Method / standard	Phase	Responsibility
Safety and access	Make the site safe and control access until the closure criteria are met.	Fence and sign the rehabilitated landform and any residual water body; close or ramp all open excavations; remove unstable structures; maintain access control until the stability and vegetation criteria are achieved.	Closure and post-closure	Applicant / Proponent
Social and land use	Implement closure and social transition.	Early closure planning in accordance with SIMP item 15 , retrenchment procedures, portable-skills training and prioritised local labour and SMME participation in rehabilitation and monitoring contracts; livelihood restoration for informal occupiers under IFC PS5 with alternative grazing land secured before access is lost; closure timelines, land use and safety measures communicated in an accessible form; closure-stage grievance mechanism maintained.	Decommissioning and closure	Applicant / Proponent with Community Liaison Officer
Monitoring and close-out	Monitor rehabilitation performance and apply adaptive management.	Vegetation and surface condition inspections with fixed-point photographs at the end of the first rainy season, quarterly for the first two years and thereafter as required; drainage inspections monthly during active rehabilitation and after significant rainfall; weekly ECO and freshwater-specialist inspection near wetlands during decommissioning.	Closure and post-closure	Mine Environmental Representative / Environmental Control Officer
Monitoring and close-out	Close out non-conformances and apply for relinquishment.	All non-conformances recorded, assigned, corrected within agreed timeframes and verified as closed; closure performance monitoring quarterly until the closure objectives and sign-off criteria are achieved; closure certificate application in terms of section 43 of the MPRDA supported by the written confirmations required under section 43(5).	Post-closure	Applicant / Proponent

2.20 FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE SCHEDULE

A high-level example of a final rehabilitation, decommissioning and closure schedule is set out in Table 33 and is aligned to a typical mine plan. Deposition on the Deelkraal II TSF is planned from 2028 to 2048, with Compartment 3 phased from 2036, and reclamation of the dormant Deelkraal I and Kusasalethu facilities proceeds over the same period. The schedule is therefore expressed relative to the cessation of deposition (Year 0) rather than against fixed calendar dates, so that it remains valid as the mine plan is revised. It will be reviewed and updated annually together with the Annual Rehabilitation Plan and the financial provision quantum, and re-based whenever the life of facility, the rate of rise or the reclamation sequence changes. Concurrent rehabilitation is carried throughout the operational life so that the closure-phase workload, and the liability associated with it, is progressively lessened rather than accumulated to the end of operations.

Two closure scenarios are provided for, in line with the DMR Guideline and GN R 1147. The scheduled (planned) closure scenario is the sequence shown in Table 33[2], where closure follows the completion of deposition in accordance with the mine plan, the Holder executes the work using its own resources and established contractors, and the actions are sequenced so that dependencies are respected and rehabilitation is undertaken progressively. The unscheduled (premature) closure scenario assumes that operations cease unexpectedly at any point in the life of the facility and that the full outstanding liability falls due immediately. The unscheduled scenario is accordingly not a schedule but a snapshot of the liability at the reporting date, and it governs the quantum of financial provision that must be maintained at all times. The quantum is reported in Section 2.24.6; and is required to be reassessed annually.

The critical dependencies in the schedule are as follows. Final shaping and capping of the Deelkraal II TSF cannot commence until deposition has ceased and the tailings mass has drained sufficiently to carry plant. Topsoil replacement and revegetation follow final shaping and must be timed to the onset of the rainy season, which fixes the earliest practicable completion date for each rehabilitation domain. The clean and dirty water separation and containment system may only be decommissioned once runoff quality complies with the closure water-quality criteria and all contact-water sources have been removed. The relinquishment assessment cannot be undertaken until the vegetation, erosion, land capability and water-quality criteria set out in Table 30 have been met over the required consecutive monitoring periods. Long-term groundwater monitoring and latent-risk management extend well beyond the active aftercare period, because the existing Deelkraal and Kusasalethu plumes are predicted to attenuate to below licence limits only over approximately 50 years

[2] Note this is a closure schedule rather than a planned closure cost. No planned cost has been provided for in this report, only the unscheduled closure costs.

Table 33: High level example of FRDCP Schedule.

Closure action / milestone	Area	Concurrent	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4–5	Yr 6–10	Yr 11–20	Yr 21+
Progressive rehabilitation of completed TSF side slopes and released areas	Deelkraal II TSF									
Reclamation of the dormant Deelkraal I and Kusasalethu TSFs and rehabilitation of the vacated footprints	Dormant TSFs									
Annual Rehabilitation Plan, quantum review and FP audit	All areas									
Final landform, cover and geotechnical closure design; dam-break analysis	Deelkraal II TSF									
Closure and social transition planning, retrenchment procedures and portable-skills training	Social and land use									
Cessation of deposition on the Deelkraal II TSF	Deelkraal II TSF									
Dewatering of the tailings mass and operation of the underdrainage and seepage collection	Deelkraal II TSF									
Demolition and removal of plant upgrades, pump stations, pipelines and powerlines	Infrastructure									
Demolition waste classification, recycling and licensed disposal	Waste									
Decommissioning of the return water dam and pump stations	Water									
Final shaping and capping of the TSF top surface and side slopes	Deelkraal II TSF									
Rehabilitation of laydown areas, servitudes and redundant access and haul roads	Infrastructure									

Closure action / milestone	Area	Concurrent	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4–5	Yr 6–10	Yr 11–20	Yr 21+
Topsoil replacement and revegetation of the TSF landform and vacated footprints	Soils and biodiversity									
Wetland, drainage feature and buffer rehabilitation (HGM 3, 5 and 6)	Wetlands									
Reinstatement of natural drainage and removal of the clean / dirty water separation system	Surface water									
Alien invasive plant control and follow-up until indigenous cover is established	Biodiversity									
Erosion repair, re-seeding and rehabilitation maintenance (active aftercare)	All areas									
Vegetation, land capability and closure performance monitoring	Soils and biodiversity									
Groundwater and surface water quality monitoring	Water									
Long-term landform stability monitoring under the GISTM	Deelkraal II TSF									
Latent and residual risk management and contingency remediation (ERA)	All areas									
Relinquishment assessment and closure certificate application (MPRDA s43)	All areas									



2.21 ORGANISATIONAL CAPACITY

Harmony, as the holder of the mining right, is responsible for compliance with all provisions of the right, the environmental authorisation, the Environmental Management Programme and this Closure Report, and for ensuring that the financial provision remains adequate. It is critical that roles and responsibilities for the effective planning, implementation, monitoring and revision of the closure process are clearly defined and provided for. The Holder is ultimately responsible for ensuring compliance with all the provisions of the Right and associated plans, as well as other relevant legal requirements. The Holder must ensure knowledge and understanding of the applicable legislation, guidelines, and industry best practices. The following organisational capacity is required:

- Internal Closure champion: a suitably qualified person(s) who will be accountable for the following:
    - Driving the ongoing development, refinement, and implementation of the closure plan;
    - Resourcing and implementing the plan;
    - Ongoing management and monitoring requirements to support the closure plan;
    - To ensure the integration of the rehabilitation and closure activities with general operational activities; and
    - Ensure legal compliance and deliver on commitments.
- Internal Social champion: a suitably qualified person(s) who will be accountable for the following:
    - Develop and implement training strategies for internal training;
    - Develop and implement effective communication with all stakeholders;
    - Develop and implement a stakeholder forum to promote information and idea sharing regarding closure related aspects and/or ensuring meaningful contributions to existing forums; and
    - Continually develop the relationship with I&APs, to promote the social licence to operate and close and decommission.
- Independent Environmental Assessment Practitioner: This individual will be appointed to ensure compliance with the requirements of the FRDCP and specifically to undertake the following tasks:
    - Undertake the prescribed independent auditing; and
    - Undertake period review and assessment of accumulated monitoring data and provide recommendations for review and amendment of the closure planning where applicable.
- Internal or external specialists: The monitoring of the implementation of the closure process and the subsequent revisions, adjustments and alterations will in many cases need to be conducted by suitably qualified specialists (e.g. soils and agricultural specialist, biodiversity and wetland specialist, ground and surface water specialists, engineering and landform design specialists). Relevant specialists should be identified and budgets provided for the scope of work to align with the obligations presented in this closure plan.

Further education, training and capacity building is critical to ensure that the rehabilitation and closure activities align with evolving internationally accepted best practice and research. In this regard regular review of international best practice should be undertaken and where applicable implemented throughout the project programme

2.22 IDENTIFICATION OF CLOSURE PLAN GAPS

At the time of compilation, this closure plan is based on the best available information, including the findings of the Environmental Impact Assessment and supporting specialist studies, the approved mine plan and design parameters for the Deelkraal II TSF and associated infrastructure, and prevailing statutory closure requirements. The principal gaps identified to date are those recorded in Section 2.17.7 (Assumptions and Ongoing Closure Research), and relate primarily to the verification of geotechnical settlement and slope stability predictions, the long-term geochemical behaviour of the tailings material and resultant closure water quality, the performance of the cover system and revegetation protocols under site-specific conditions, and the recovery trajectory of the affected freshwater and terrestrial ecosystems.

No gaps have been identified that materially compromise the technical or financial adequacy of the plan at this stage. The identification of closure plan gaps is, however, an iterative process, and this Section will be reviewed and updated during the next annual update of the financial provision, as required in terms of Regulation 11 of GN R1147. The outputs of the environmental monitoring programme (groundwater, surface water, geotechnical, biodiversity and rehabilitation monitoring), the results of internal and external EMPr compliance audits, the findings of the annual rehabilitation performance assessment, and the outcomes of the closure trials and research activities described in Section 2.17.7 will be interrogated to determine whether any deficiencies, information gaps or changes in the operational or regulatory environment necessitate amendment of the closure objectives, closure actions or associated cost estimates. Any gaps so identified will be recorded in a closure gap register, assigned to a responsible party, and addressed in the subsequent revision of this plan.

2.23 RELINQUISHMENT CRITERIA

Relinquishment criteria are the measurable component of the final rehabilitation and closure objectives , the auditable standards against which rehabilitation success is judged and a closure certificate sought. The criteria below follow the LaRSSA approach of pairing each rehabilitation aspect with a measurable indicator (landform, soils / land capability, vegetation and land use), and should be agreed with the competent authority.

Domain	Aspect	Relinquishment criterion (measurable indicator)	Verification method
Deelkraal II TSF final landform	Landform stability and erosion	Final profile conforms to the approved closure design (side slopes not steeper than the approved angle inclusive of berms, no ponding on the crest); no gully, scour, undercutting or slumping requiring repair; measured settlement rate below 5 mm per year and stable or declining; phreatic surface and pore pressures at equilibrium.	As-built survey against the approved closure drawing; annual walkover and photographic record from fixed points; settlement beacon survey; piezometer and inclinometer records over three consecutive years; certification by the Engineer of Record.
Deelkraal II TSF final landform	Vegetation cover	Basal cover of at least 70% and aerial (canopy) cover of at least 80% of the approved seed mix, with bare ground not exceeding 10%; species composition trending toward the reference community; recruitment evident and cover sustained for two consecutive growing seasons without supplementary irrigation, fertilisation or re-seeding.	Quantitative transect and quadrat survey at the end of the growing season by a SACNASP-registered practitioner, against undisturbed reference control sites; two consecutive annual surveys.



All rehabilitated domains	Alien and invasive plant species	No Category 1a or 1b species present; Category 2 and 3 species under control; total alien invasive cover below 5% with no free-seeding individuals at the time of sign-off.	Bi-annual alien invasive plant survey (growing and non-growing season) and control programme records for the two years preceding sign-off.
Reclaimed dormant TSF footprints, plant, pump station and infrastructure footprints	Soils and land capability	Replaced topsoil depth of at least 250 mm confirmed on a sampling grid; bulk density and penetrometer resistance within the range of the reference control sites; no residual hydrocarbon or chemical contamination above the applicable Soil Screening Values (GN R.331 of 2014); land capability class restored to the agreed post-mining land use.	Soil sampling on an agreed grid with laboratory analysis; land capability classification by a SACNASP-registered soil scientist; comparison against undisturbed reference sites.
Return water dams (main RWD, RWD2 and RWD3), solution trenches and stormwater works	Surface water	All contaminated water infrastructure decommissioned, cleaned and either removed or converted to an approved post-closure function; clean and dirty water separation reinstated to the pre-development drainage regime; discharge and downstream compliance point water quality within the applicable Water Use Licence limits and Resource Quality Objectives over four consecutive quarterly determinations.	Decommissioning completion certificates; quarterly surface water quality monitoring at the discharge and downstream compliance points; annual water balance reconciliation.
Deelkraal II TSF and reclaimed footprints	Groundwater	Seepage and underdrainage flows stabilised at or below the design rate and declining; down-gradient groundwater quality demonstrating a sustained declining trend in sulphate and manganese consistent with the modelled natural attenuation trajectory; no evidence of an expanding plume beyond the monitored zone. Groundwater quality is not expected to return to baseline within the aftercare period , see Section 2.17.6.4.	Quarterly to annual groundwater monitoring across the perimeter and down-gradient network; five-yearly recalibration of the numerical groundwater model against measured trends; independent geohydrological sign-off.
Deelkraal II TSF final landform	Radiological	Cover system in place and verified; public dose to the most-exposed member of the public demonstrated to be below the applicable dose constraint; NNR concurrence obtained for release from regulatory control.	Post-closure radiological dose assessment on the completed cover profile; NNR review of the Certificate of Registration conditions and written concurrence.



Pipeline, powerline and road servitudes	Infrastructure removal and servitude rehabilitation	All redundant pipelines, powerlines, structures and foundations removed or demolished to the agreed depth below final surface level; servitudes ripped, topsoiled, shaped to blend with the surrounding landform and revegetated to the vegetation criterion above; no residual hardstanding, rubble or scrap remaining.	Demolition and waste disposal records including safe disposal certificates; as-built survey; joint site walkover with the landowner and the competent authority.
Wetlands and watercourses	Aquatic ecosystem condition	Retained and rehabilitated wetland units showing a stable or improving Present Ecological State relative to the closure baseline; hydrological connectivity and hydroperiod reinstated; no ongoing sediment or contaminant delivery from rehabilitated areas.	Bi-annual to annual wetland condition assessment using WET-Health and WET-EcoServices against the closure baseline and an upstream reference site.
Whole project area	Safety, access and post-closure land use	No open excavations, unstable edges, unsecured structures or residual water bodies presenting a safety hazard; access arrangements and any residual land-use restrictions formally recorded; post-closure land use and stewardship responsibilities agreed and recorded in the property title or an equivalent instrument.	Closure safety audit; signed post-closure land use and stewardship agreement; registration of any servitude or title condition.

2.24 CLOSURE COST ESTIMATION AND FINANCIAL PROVISION

2.24.1 APPROACH TO COST DETERMINATION

The closure cost was determined by MineLock Environmental Engineers (Pty) Ltd (MineLock, 2026; Appendix 1) using the rule-based master-rate method of the DMR Guideline, applied in the sequence of steps set out in Table 34. A closure quantum figure is required to represent the current environmental liability. The EIA Report (Rev. 1) records that the DMPR Guidelines apply because the mining right was granted before the 2015 Financial Provisioning Regulations took effect, and reports the unscheduled quantum, closure after the first year of construction, as R53 232 584.39 excluding VAT.

Table 34: DMR Guideline quantum method.

Step	Description
4.1	Determine the risk class of the mineral mined.
4.2	Determine the sensitivity of the area (environmental sensitivity).
4.3	Determine the multiplication factor from the risk class and area sensitivity.

Step	Description
4.4	Determine and apply the weighting factors: WF1 (nature of terrain) applied to each closure component, and WF2 (proximity to an urban centre) applied to the sum of components.
4.5	Identify the areas, volumes and lengths of disturbance for each applicable closure component (the cost inventory).
4.6	Identify closure costs from the specialist studies indicated for the risk class (DMR Table B.9).
4.7	Calculate the closure costs - the Grand Total (unscheduled, third-party) and Sub-total 1 (scheduled, in-house).

The parameters adopted are: gold as the mineral mined, at a large mine with plant and plant waste, giving a primary risk class of A; a medium environmental sensitivity; a Weighting Factor 1 of 1.10 for undulating terrain; a Weighting Factor 2 of 1.00, the site being within reach of the Carletonville urban supply centre; preliminary and general costs of 12% and contingencies of 10% of Sub-total 1; and VAT at 15%. The determination date is 29 September 2026. The quantum reported in Section 2.24.6 is for unscheduled closure, defined as closure one year into construction in accordance with the project master plan; a scheduled-closure quantum has not yet been determined.

2.24.2 BATTERY LIMITS

The project battery limits encompass the Deelkraal II Tailings Storage Facility (TSF), associated infrastructure corridors, and process/utility networks connecting to existing operational facilities (Kusasalethu Plant, Deelkraal I TSF, Savuka plant, and DF5 TSF). Each major component is assigned to a Closure Component (CC) under the DMR Quantum Guidelines for closure costing and financial provisioning under NEMA GN R.1147.

Table 35: Battery limits and closure components.

CC No.	CC Description	Battery Limits Item(s)
1	Dismantling of processing plant and equipment	Kusasalethu Plant (upgrades incl. gold and uranium sections); Deelkraal I TSF Reclamation Pump Station; Kusasalethu TSF Reclamation Pump Station; Slurry pipelines and associated infrastructure (5 no.; 35.66 km total: Deelkraal I to Kusasalethu ~10.6 km; Kusasalethu to Deelkraal II ~10.2 km; Kusasalethu TSF to Kusasalethu Plant ~2 km; Kusasalethu Plant to Savuka TSF ~4.97 km; Savuka plant to DF5 TSF ~2.9 km)
1	Dismantling of processing plant and related structures (including overland conveyors and power lines)	Powerlines (3 no.; 19.1 km total, all 22 kV or lower): Kusasalethu Plant to Deelkraal TSF (~9.2 km); Kusasalethu Plant to Kusasalethu TSF (~1.8 km); Savuka shaft to Kusasalethu Plant (~8.1 km)
5	Demolition of housing and facilities	Ancillary construction infrastructure including workshops and laydown areas
3	Rehabilitation of access roads	New access roads adjacent to pipeline routes, overhead line corridors, and around Deelkraal II TSF (where no existing access road in place)



CC No.	CC Description	Battery Limits Item(s)
6	Opencast rehabilitation including final landform	Deelkraal II TSF (430 ha; max. 65 m height; three compartments; 192.35 Mt total capacity). Final landform profiling and slope stabilisation; Cover system (Class C inverted barrier system per NEM:WA GN R.636); Final contouring for closure water quality compliance. Deposition period: 2028–2048 (20 years Compartments 1 & 2); 2036–2048 (13 years Compartment 3). Deposition method: Cyclone. Type 3 waste classification.
8(A)	Rehabilitation of overburden and spoils	Topsoil stockpiles (stripped and managed during reclamation); Overburden stockpiles (associated with reclamation operations)
8(B)	Rehabilitation of processing waste	Deelkraal II TSF processing waste (tailings material deposited via cyclone method; Type 3 waste classification; Class C liner system required)
13	Water management (Separating clean and contaminated water streams)	Main return water dam (new, vicinity of Deelkraal II TSF); RWD2 and RWD3, two smaller return water dams (vicinity of Deelkraal II TSF); Underdrainage system beneath Deelkraal II TSF; Process water pipelines (6 no.; ~44.12 km total): • Kusasalethu Plant to Deelkraal Reclamation ~9.54 km; • Return water to Kusasalethu Process Water Tank ~9.58 km; • DP3 Pump Station to North Boundary Dam ~4.78 km; • DP3 feed to Tau Tona RO Plant ~0.1 km; • Nursery Pumpstation #3 to Kusasalethu Process Water Tank ~9 km; • Two process water pipelines to Savuka White Tanks ~8 km; • Potable water pipeline from Rand Water supply to Deelkraal TSF (~8.52 km); • Closed-loop water recirculation system (operational through closure)
14	2 to 3 years of maintenance and aftercare	Post-closure maintenance (Deelkraal II TSF cover system, erosion control, vegetation establishment); Monitoring and inspection of all rehabilitated areas (2–3 years minimum aftercare period); Maintenance of water management infrastructure during establishment phase

The battery limits are restricted to the Deelkraal II TSF and the associated new infrastructure within the defined project area, and to the works scheduled to have commenced or been completed within the first year of construction (MineLock, 2026). Existing mine infrastructure outside the project battery limits, and pre-existing environmental liabilities, are excluded on the basis that they are provided for in an existing financial provision or closure costing. Within these limits the closure components that apply at one year into construction are

rehabilitation of access roads (CC 3), general surface rehabilitation (CC 10), fencing (CC 12) and two to three years of maintenance and aftercare (CC 14). The allocation of the full project infrastructure to closure components in Table 35 applies to the scheduled closure scenario.

2.24.3 COSTING ASSUMPTIONS AND QUALIFICATIONS

- Costs are reported in present-day terms; the master rates are escalated year-on-year to the determination date using the Statistics South Africa headline CPI (Statistical Release P0141), the final step applying the 2026 average CPI of 4.54% published to the end of September 2026 (MineLock, 2026).
- The determination assumes a third-party contractor establishes on site (giving rise to the preliminary and general allowance) for the unscheduled scenario.
- Concrete and reinforced-concrete structures are demolished to 1 m below final surface level; income from salvage does not offset the closure cost.
- Site-specific closure actions that fall outside the generally accepted closure methods on which the DMR master rates are based , commonly long-term / active water treatment, watercourse and wetland interventions, engineered drainage layers, and post-closure care and maintenance beyond the DMR aftercare period , are not covered by the master rates and must be quantified and secured separately.
- The unscheduled closure liability is limited to the works scheduled to have commenced or been completed within the first year of construction. The areas to be cleared and disturbed in that period, 174.5 ha of surface disturbance and 101 500 m² of new access road, were provided by the project engineers and adopted directly (MineLock, 2026).
- Existing mine infrastructure outside the project battery limits, and pre-existing environmental liabilities, are assumed to be adequately provided for in an existing financial provision or closure costing.
- New access roads comprise a two-lane carriageway of two 3.5 m lanes, giving an overall width of 7 m.
- Topsoil is stripped to a depth of 450 mm and stockpiled to a maximum height of 3 m (Coaltech, 2016) for the purpose of estimating stockpile footprints.
- No site visit was undertaken by the cost estimator; the estimate is based on project information supplied by EIMS in August 2026.

2.24.4 UNIT RATES

The unit rates are the DMR master rates (DMR Guideline Table B.6), escalated as above. The master rates are all-inclusive for the generally accepted closure method for each component and include topsoil replacement and revegetation where applicable. Table 36 presents the DMR base rates and the master rates as escalated by MineLock (2026) to September 2026. The MineLock closure costing, including its escalation basis, is attached as Appendix 1.

Table 36: DMR base rates and escalated master rates (MineLock, 2026).

CC	Component	DMR Base rate	CPI% Escalated Master Rate
1	Dismantling of processing plant and related structures (including overland conveyors and power lines).	R6.82	R20.61
2A	Demolition of steel buildings and structures.	R95.00	R289.97
2B	Demolition of reinforced concrete buildings and structures.	R140.00	R427.31

3	Rehabilitation of access roads.	R17.00	R51.89
4A	Demolition and rehabilitation of electrified railway lines.	R165.00	R503.62
4B	Demolition and rehabilitation of non-electrified railway lines .	R90.00	R277.70
5	Demolition of housing and facilities.	R190.00	R579.93
6	Opencast rehabilitation including final voids and ramps .	R96 700.00	R295 152.69
7	Sealing of shafts, adits and inclines.	R51.00	R155.66
8A	Rehabilitation of overburden and spoils.	R66 400.00	R202 669.47
8B	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste).	R82 700.00	R252 421.17
8C	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste).	R240 200.00	R733 150.74
9	Rehabilitation of subsided areas .	R55 600.00	R169 705.17
10	General surface rehabilitation, including grassing of all denuded areas.	R52 600.00	R160 548.41
11	River diversions .	R52 600.00	R160 548.41
12	Fencing.	R60.00	R183.14
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required).	R20 000.00	R61 045.03
14	2 to 3 years of maintenance and aftercare.	R7 000.00	R21 365.76
15A	Specialist study , update of geohydrological models	-	R446 538.82
15B	Specialist study , EIA and closure application, including public participation and specialist studies	-	R2 551 650.39
15C	Not used , final groundwater modelling is included in 15A	-	-

2.24.5 CLOSURE COMPONENTS, METHODS AND ALLOWANCES

The cost inventory below applies the DMR closure components (DMR Guideline Table B.10). The quantities, rates and factors in Table 37 are those determined by MineLock (2026) for unscheduled closure, defined as closure one year into construction; components that do not apply at that point carry a nil quantity.

Table 37: Closure quantum for unscheduled closure (MineLock, 2026).

No.	Closure component	Unit	A. Quantity	B. Master rate (R)	C. Mult. factor	D. WF1	E = A×B×C×D (R)
1	Dismantling of processing plant and related structures (incl. overland conveyors and power lines)	m³	-	R20.61	1.00	1.10	-
2A	Demolition of steel buildings and structures	m²	-	R289.97	1.00	1.10	-
2B	Demolition of reinforced-concrete buildings and structures	m²	-	R427.31	1.00	1.10	-
3	Rehabilitation of access roads	m²	,101 500	R51.89	1.00	1.10	R5 793 776.41
4A	Demolition and rehabilitation of electrified railway lines	m	-	R503.62	1.00	1.10	-
4B	Demolition and rehabilitation of non-electrified railway lines	m	-	R277.70	1.00	1.10	-
5	Demolition of housing and facilities	m²	-	R579.93	1.00	1.10	-
6	Opencast rehabilitation including final voids and ramps	ha	-	R295 152.69	0.04	1.10	-
7	Sealing of shafts, adits and inclines	m³	-	R155.66	1.00	1.10	-
8A	Rehabilitation of overburden and spoils	ha	-	R202 669.47	1.00	1.10	-
8B	Rehabilitation of processing-waste deposits and evaporation ponds (basic, salt-producing waste)	ha	-	R252 421.17	1.00	1.10	-



No.	Closure component	Unit	A. Quantity	B. Master rate (R)	C. Mult. factor	D. WF1	E = A×B×C×D (R)
8C	Rehabilitation of processing-waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	-	R733 150.74	0.80	1.10	-
9	Rehabilitation of subsided areas	ha	-	R169 705.17	1.00	1.10	-
10	General surface rehabilitation, including grassing of all denuded areas	ha	174.50	R160 548.41	1.00	1.10	R30 817 267.33
11	River diversions	ha	-	R160 548.41	1.00	1.10	-
12	Fencing	m	14 500	R183.14	1.00	1.10	R2 579 901.70
13	Water management (pumping and treatment)	ha	-	R61 045.03	0.67	1.10	-
14	Two to three years of maintenance and aftercare	ha	174.50	R21 365.76	1.00	1.10	R4 101 158.31
15A	Specialist study, update of geohydrological models	sum	-	R446 538.82	1.00	1.10	-
15B	,Specialist study , EIA and closure application, including public participation and specialist studies	sum	-	R2 551 650.39	1.00	1.10	-
Sub-total 1 (sum of components 1–15)							R43 152 447.12

2.24.6 SUMMARY OF CALCULATED CLOSURE COST

Item	Costing
Sub-total 1 (components 1–15)	R43 152 447.12

Item	Costing
Preliminary & general (12% of Sub-total 1 if < R100m; 6% if ≥ R100m)	R5 235 991.91
Contingencies (10% of Sub-total 1)	R5 178 293.65
Sub-total 2	R48 330 740.78
Weighting Factor 2 (proximity to urban centre) applied	R 52 645 985.49
VAT (15%)	R7 896 897.52
GRAND TOTAL (incl. VAT)	R60 542 883.31

The quantum of financial provision to be maintained as at the month of commencement of activities once approved EA is received, is R60 542 883.31 (incl. VAT) for closure one year into construction.

2.25 MONITORING, AUDITING AND REPORTING

This section sets out the monitoring, auditing and reporting requirements relating to the closure risk assessment, legal requirements and knowledge gaps. To avoid duplication, the FRDCP monitoring programme, the ARP monitoring of FRDCP risks (Section 3.2) and the ERA post-closure monitoring (Section 4.4) are cross-referenced to a single consolidated monitoring plan rather than repeated in each section.



Table 38: Auditing requirements.

Audit	Responsible party	Frequency	Close-out approach
EMPr and Environmental Authorisation compliance audit (Regulation 34, EIA Regulations 2014)	Independent EAP appointed by Harmony Gold; site ECO provides monitoring records and evidence	Annually, or as stipulated in the Environmental Authorisation; report submitted to the competent authority and made available to I&APs	Non-conformances entered into the environmental action tracker with a responsible person and due date; corrective action verified at the following internal audit; material or repeat findings escalated to the closure gap register
Water Use Licence and GN R.704 compliance audit	Environmental Manager supported by an independent water specialist; submitted to DWS	Annually, or as stipulated in the WUL, with quarterly internal compliance verification of the water balance and monitoring results	Deviations addressed through the water management action plan; licence amendment initiated where closure design changes affect the authorised water uses or the clean / dirty water separation system
Waste Management Licence compliance and barrier system integrity audit (Class C containment, GN R.636)	Engineer of Record, supported by a geosynthetics / CQA specialist	Annually during operations; on completion of each compartment; and prior to and on completion of final cover placement	Defects repaired and re-tested (including electrical leak location survey) before deposition or cover placement proceeds; conformance certified by the Engineer of Record and retained in the closure dossier

Table 39: Monitoring and reporting requirements.

Aspect	Standard	Locations	Frequency	Reporting
Water – surface water	DWS South African Water Quality Guidelines (Vol. 1 Domestic, Vol. 4 Aquatic Ecosystems, Vol. 5 Livestock Watering, irrigation); Resource Quality	Upstream (control) and downstream points on the receiving watercourse; the three return water dams (main RWD,	Monthly (operations and active closure); quarterly (aftercare Years 1–5); bi-annually (Years 6–10); annually thereafter until	Monthly internal water quality and water balance report; quarterly WUL compliance report to DWS; annual



Aspect	Standard	Locations	Frequency	Reporting
	Objectives for the Wonderfonteinspruit / Mooi River catchment (Vaal WMA); WUL limits; GN R.704; SANS 241:2015 where potable use applies	RWD2 and RWD3); solution trenches; clean water diversion channel discharge; closure discharge point; compliance points at 500 m and 1 000 m downstream	closure water quality criteria are met over 12 consecutive determinations	integrated water report feeding the EMPr audit, the annual FP update and Section 4.4
Water – groundwater	SANS 241:2015; DWS SAWQG (Domestic and Livestock Watering); site-specific pre-closure baseline hydrochemistry; National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN R.331 of 2014) where remediation is triggered	Minimum two borehole pairs (shallow weathered and deep fractured aquifer) up-gradient (north) and down-gradient (south) of the Deelkraal II TSF, plus two additional down-gradient boreholes where terrain permits, per the geohydrological assessment; perimeter boreholes at the three return water dams; nearest third-party and agricultural abstraction boreholes	Quarterly (operations, active closure and aftercare Years 1–5); bi-annually (Years 6–10); annually (Years 10–50), reverting to quarterly on exceedance of any trigger level	Quarterly groundwater monitoring report with trend and plume analysis; annual geohydrological review, with numerical model update every three years; results carried into the annual FP update and the ERA post-closure report
Water – seepage, underdrainage and containment integrity	Class C barrier system performance requirements (GN R.636) and Type 3 waste classification (GN R.635); design seepage threshold of <10 m³/day during active consolidation; WUL conditions; SANS 10286 and GISTM	Underdrainage collection sumps and toe drains for all three compartments; solution trenches; leak detection monitoring points; the three return water dams (main RWD, RWD2 and RWD3)	Flow weekly and quality monthly (operations and active closure); flow monthly and quality quarterly (Years 1–5); flow quarterly and quality bi-annually thereafter until flows stabilise below the design threshold	Monthly water balance reconciliation; annual containment performance certification by the Engineer of Record; exceedance of the design seepage threshold escalated to the ITRB and the closure gap register
Landform, erosion and geotechnical stability	Approved closure landform design (final slopes 1V:2.5H including berms; maximum height 65 m); SANS 10286; GISTM; Dam Safety Regulations GN R.139 of 2012; long-term drained factor of safety >1.5; relinquishment criteria of	All Deelkraal II TSF outer slopes, crest and basin across the three compartments; embankments of the main RWD, RWD2 and RWD3; stormwater diversion channels and solution trenches; rehabilitated	Quarterly walkover inspection and survey (operations and active closure); quarterly (Years 1–3), bi-annually (Years 4–10), annually to triennially (Years 10–20+); additionally after any rainfall	Quarterly geotechnical monitoring report to the Engineer of Record; annual dam safety inspection report and five-yearly dam safety evaluation to DWS; annual



Aspect	Standard	Locations	Frequency	Reporting
	settlement rate <5 mm/yr and pore pressures at equilibrium	pipeline, powerline and access road corridors; topsoil and overburden stockpile footprints	event exceeding the 1:5-year 24-hour design storm; piezometers monthly reducing to quarterly and then annually	ITRB review; erosion features exceeding trigger criteria repaired within one dry season and verified at the following inspection
Soils and land capability	National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN R.331 of 2014) – SSV1, with site-specific SSV2 where motivated; Minerals Council / Coaltech Guidelines for the Rehabilitation of Mined Land (2007); DALRRD land capability classification; pre-disturbance baseline and the agreed post-mining land use (grazing, with arable capability restored where achievable)	All topsoil stockpiles; rehabilitated pipeline, powerline and access road servitudes; demolished infrastructure footprints (pump stations, plant upgrade areas, workshops and laydown areas); TSF cover system growth medium; undisturbed reference sites on equivalent soil forms	Baseline at stripping and at stockpile establishment; annual stockpile condition monitoring during operations; on completion of soil replacement and annually for the first three years post-rehabilitation; bi-annually Years 4–10 until land capability targets are demonstrated over two consecutive assessments	Annual ECO monitoring report by a SACNASP-registered soil scientist, reported against relinquishment criteria in the annual EMPr compliance audit and the annual FP update
Vegetation and rehabilitation	≥80% basal and aerial cover of the approved seed mix by the end of Year 2 of active closure, self-sustaining without supplementary inputs by Year 5; composition trending toward the Carletonville Dolomite Grassland (Gh 15) reference community; NEM:BA Alien and Invasive Species Regulations (as amended) – no Category 1a or 1b species and Category 2 and 3 species controlled; CARA (Act 43 of 1983); veld condition at or above the reference control site	Fixed transects and quadrats on the TSF cover and outer slopes (per compartment and slope aspect); footprints of the three return water dams; rehabilitated servitudes, road and demolished infrastructure footprints; topsoil stockpiles; retained and offset wetland areas; undisturbed reference control sites	Quarterly fixed-point photographic monitoring during establishment (Years 1–3); annual quantitative survey at the end of the growing season (February–April) for Years 1–10; every three to five years thereafter to relinquishment; alien invasive plant surveys bi-annually (growing and non-growing season) through Year 10	Annual rehabilitation performance report against closure criteria, including photographic record, transect data and trend analysis; alien invasive plant control programme progress report; input to the annual EMPr audit, the FP update and the re-costing of the rehabilitation liability
Air quality and dust fallout	National Dust Control Regulations (GN R.827 of 2013) – 600 mg/m²/day residential and 1 200 mg/m²/day non-	Dust fallout network on the TSF perimeter and at the nearest sensitive receptors in the prevailing	Monthly (30 ± 2 day exposure period) during operations, decommissioning and active	Monthly dust fallout results; annual air quality performance report in the EMPr compliance

Aspect	Standard	Locations	Frequency	Reporting
	residential, with no more than two non-sequential exceedances per annum; National Ambient Air Quality Standards (GN R.1210 of 2009); AQIA-modelled compliance premised on ≥80% control efficiency achieved through grassing of TSF slopes and wet deposition	downwind direction; access and haul road corridors	closure; monthly through aftercare Years 1–3; discontinued once ≥80% vegetation cover is sustained and 12 consecutive months of compliance are recorded	audit; exceedances investigated within 14 days with corrective action (dust suppression, re-seeding) recorded and verified
Radiological	National Nuclear Regulator Act 47 of 1999 and Certificate of Registration conditions; public dose constraint of 250 µSv/yr for the most-exposed member of the public; IAEA GSR Part 3	TSF surface and perimeter; final cover profile; nearest residential and agricultural receptors; surface water and groundwater monitoring points	Annually during operations and active closure; on completion of the cover system; every two years (biennially) through the post-closure period, or as directed by the NNR	Annual radiation compliance report to the NNR; post-closure dose assessment supporting application for release from regulatory control and relinquishment
Wetlands and aquatic ecosystems	DWS WET-Health and WET-EcoServices assessment tools; SASS5 reference conditions for the applicable ecoregion; PES and EIS not to decline below the pre-construction baseline; performance conditions of the Offset Strategy (EIA Appendix 4)	Retained wetland units adjacent to and down-gradient of the TSF; wetland offset receiving areas; upstream reference wetland and river sites; downstream impacted sites	Bi-annually (wet and dry season) during operations and active closure; annually through aftercare Years 1–10; every five years thereafter to demonstrate the recovery trajectory	Annual wetland and aquatic monitoring report; offset performance report at each five-year review; input to ERA post-closure monitoring (Section 4.4) and the offset adaptive management protocol
Terrestrial biodiversity	NEM:BA (Act 10 of 2004) and the Threatened or Protected Species Regulations; provincial conservation plan (CBA / ESA) status; pre-construction baseline, with recovery to ≥50% of baseline avifaunal abundance by Year 20 as the interim performance target	Fixed transects and point-count stations on the rehabilitated TSF and servitudes; offset areas; undisturbed reference control sites	Baseline pre-construction; annually during active closure and aftercare Years 1–5; every five years to Year 20 and beyond	Periodic terrestrial biodiversity monitoring report; offset effectiveness assessment on a five-year review cycle; input to ERA post-closure monitoring (Section 4.4)

The frequencies in Table 39 are set to meet or exceed the minimum requirements of the EMPr (Tables 8 and 10): quarterly sampling for pollutants for five years once vegetation is established, groundwater and radiation monitoring at least biennially after closure, and an update of the numerical groundwater model every three years. Where Table 39 and the EMPr differ, the more frequent requirement applies.

3 ANNUAL REHABILITATION PLAN (ARP)

This Annual Rehabilitation Plan accompanies the environmental authorisation application for the proposed Deelkraal II TSF. The Final Rehabilitation, Decommissioning and Closure Plan in Section 2 is not yet in effect, no authorised activity has commenced, and there is accordingly no preceding twelve-month implementation period. The requirements of items 3(c), 3(d) and 3(f) of Appendix 3 to GN R1147, monitoring results, shortcomings and the planned-versus-actual review, are therefore reported as not applicable to this first submission, and will be completed in the first annual update following commencement of the authorised activity. Item 3(e), planned rehabilitation activities for the forthcoming twelve months, is addressed in Section 3.4 on the basis of the construction and deposition programme in Section 2.1.2.

Table 40: NEMA GN R1147 Annual Rehabilitation Plan requirements

No.	Requirements	Section/s
3(a)	Details of the - (i) person or persons that prepared the plan; (ii) professional registrations and experience of the person or persons; and (iii) timeframes of implementation of the current, and review of the previous rehabilitation activities.	Preparers, registrations and experience: Section 1.2 (Table 1). Timeframes of implementation: Section 3.4, read with Section 2.20 (Table 33).
3(b)	The pertinent environmental and project context relating directly to the planned annual rehabilitation and remediation activity.	Section 3.1, read with Section 2.1 and Sections 2.2 to 2.15.
3(c)	Results of monitoring of risks identified in the final rehabilitation, decommissioning and mine closure plan with a view to informing rehabilitation and remediation activities.	Section 3.2, read with Section 2.25 (Table 39). Not applicable to this first submission: the FRDCP is not yet in effect and no monitoring results exist.
3(d)	An identification of shortcomings experienced in the preceding 12 months.	Section 3.3. Not applicable to this first submission: there is no preceding 12-month implementation period.
3(e)	Details of the planned annual rehabilitation and remediation activities or measures for the forthcoming 12 months, including those which will address the shortcomings contemplated in 3(d) above or which were identified from monitoring in the preceding 12 months, and including - (i) if no areas are available for annual rehabilitation and remediation concurrent with mining, an indication to that effect and motivation why no annual rehabilitation or remediation can be undertaken; (ii) where areas are available for annual rehabilitation and remediation concurrent with mining, annual rehabilitation and remediation activities related to previous disturbance or expected planned impacts and disturbance, as per the	Section 3.4, read with Section 2.19 (Table 32), Section 2.20 (Table 33), Section 2.17.3 (Table 30) and Section 2.18 (Table 31).



No.	Requirements	Section/s
	mine works programme, in the period under consideration, which should be tabulated and must indicate, but not necessarily be limited to. - (aa) nature or type of activity and associated infrastructure; (bb) planned remaining life of the activity under consideration; (cc) area already disturbed or planned to be disturbed in the period of review; (dd) percentage of the already disturbed or planned to be disturbed area available for concurrent rehabilitation and remediation activities; (ee) percentage of the already disturbed or planned to be disturbed area available as per (dd) and on which concurrent rehabilitation and remediation can be undertaken; (ff) notes to indicate why total available or planned to be available area differs from area already disturbed or planned to be disturbed; (gg) notes to indicate why concurrent rehabilitation will not be undertaken on the full available or planned to be available area; (hh) details of rehabilitation activity planned on this area for the period of review; (ii) the pertinent closure objectives and performance targets that will be addressed in the forthcoming year, which objectives and targets are aligned to the final rehabilitation, decommissioning and mine closure plan; (jj) description of the relevant closure design criteria adopted in the annual rehabilitation and remediation activities and the expected final land use once all rehabilitation and remediation activities are complete for the activity or aspect; and (iii) a site plan indicating at least the total area disturbed, area available for rehabilitation and remediation and the area to be rehabilitated or remediated per aspect or activity.	
3(f)	A review of the previous year's annual rehabilitation and remediation activities, indicating a comparison between activities planned in the previous year's annual rehabilitation and remediation plan and actual rehabilitation and remediation implemented, which should be tabulated and as a minimum contain- (aa) area planned to be rehabilitated and remediated during the plan under review; (bb) actual area rehabilitation or remediated; and	Section 3.3. Not applicable to this first submission: no previous annual rehabilitation plan exists and no rehabilitation has been undertaken.



No.	Requirements	Section/s
	(cc) if the variance between planned and actual exceeds 15%, motivation indicating reasons for the inability to rehabilitate or remediate the full area.	
3(g)	Costing, including- (i) an explanation of the closure cost methodology; (ii) auditable calculations of costs per activity or infrastructure; (iii) cost assumptions; and (iv) monitoring and maintenance costs likely to be incurred both during the period of the annual rehabilitation plan and those that will extend past the period of the final rehabilitation, decommissioning and mine closure plan, on condition that the monitoring and maintenance costs included in previous annual rehabilitation plans must be accumulated into subsequent versions of the annual rehabilitation plan until such time as the monitoring and maintenance obligation is discharged.	Section 3.5, read with Section 2.24 and Appendix 1.

3.1 OBJECTIVE OF THE ARP

The ARP is valid for one year and is updated annually. It defines the concurrent rehabilitation and remediation activities for the forthcoming 12 months and how they relate to the closure vision in the FRDCP, indicates which closure objectives and criteria are being achieved, and must be measurable and auditable. Its objectives are to: review concurrent rehabilitation already implemented; set rehabilitation goals and outcomes for the next 12 months that contribute to the post-mining land use and closure vision; establish a plan, schedule and budget for the next 12 months; identify and address shortcomings from the preceding 12 months; and evaluate and update the cost of rehabilitation and closure to supplement the financial provision.

3.2 RESULTS OF MONITORING OF FRDCP RISKS

The results of monitoring of the risks identified in the FRDCP, used to inform rehabilitation and remediation activities, are drawn from the consolidated monitoring plan (Section 2.25). As this report is a preliminary submission forming part of an Environmental Impact Assessment (EIA) in support of an Environmental Authorisation (EA) application, the FRDCP is not yet in effect. The FRDCP will be implemented once the EA is approved and operational activities commence. Subsequently, one year after operations begin, the ARP will be updated to incorporate monitoring reports from the preceding 12 months.

3.3 SHORTCOMINGS IN THE PRECEDING 12 MONTHS

As this report is a preliminary submission forming part of an EIA in support of an EA application, the FRDCP is not yet in effect. The FRDCP will be implemented once the EA is approved and operational activities commence. Subsequently, one year after operations begin, the ARP will be updated to address shortcomings in the preceding 12 months of rehabilitation.

3.4 PLANNED ANNUAL REHABILITATION AND REMEDIATION ACTIVITIES

As this report is a preliminary submission forming part of an EIA in support of an EA application, the FRDCP is not yet in effect. The FRDCP will be implemented once the EA is approved and operational activities commence. The ARP outlines will need to be updated once activities commence upon receipt of the authorised EA, including the planned annual rehabilitation and remediation activities for the upcoming 12 months.

3.5 COSTING

No concurrent rehabilitation is scheduled for the first twelve months, as the facility will be under construction and deposition will not have commenced. The annual rehabilitation activities in Section 3.4 are limited to topsoil stockpile protection, alien invasive plant control and the rehabilitation of temporary works areas as they are vacated. The liability that would arise if the project were to close at the end of the first year of construction is provided for in the unscheduled closure quantum of R60 542 883.31 (incl. VAT) in Section 2.24.6, and is not repeated here.



4 ENVIRONMENTAL RISK ASSESSMENT (ERA): LATENT AND RESIDUAL IMPACTS

The ERA determines the potential financial liability associated with managing latent and residual environmental impacts after closure, once the initial relinquishment criteria have been achieved, with reference to the proposed post-closure land use. Its content requirements (Appendix 5) are listed below.

Table 41: NEMA GN R1147 Environmental Risk Assessment requirements

No.	Requirements	Section
3(a)	Details of- (i). the person or persons that prepared the plan; (ii). the professional registrations and experience of the preparers;	Section 1.2 (Details of Specialists), read with Table 1.
3(b)	details of the assessment process used to identify and quantify the latent risks, including- (i). a description of the risk assessment methodology inclusive of risk identification and quantification; (ii). substantiation why each risk is latent, including why the risk was not or could not be mitigated during concurrent rehabilitation and remediation or during the implementation of the final rehabilitation, decommission and closure plan; (iii). a detailed description of the drivers that could result in the manifestation of the risks, to be presented within the context of closure actions already having been implemented during the execution of concurrent rehabilitation or during the implementation of the final rehabilitation, decommission and closure plan; (iv). a description of the expected timeframe in which the risk is likely to manifest, typically as expected years after closure, and the duration of the impact, including motivation to support these timeframes; (v). a detailed description of the triggers which can be used to identify that the risk is imminent or has manifested, how this will be measured and any cost implications thereof; (vi). results and findings of the risk assessment; (vii). an explanation of changes to the risk assessment results as applicable in annual updates to the plan;	Assessment process, substantiation, drivers, timeframes and findings: Section 4.2 (Table 42). Methodology: Sections 2.16.1 and 2.16.3. Triggers: Section 4.3 (Table 43) and Section 4.4 (Table 44). Changes in annual updates: Section 2.22.
3(c)	management activities, including- (i). monitoring of results and findings, which informs adaptive or corrective management and/or risk reduction activities; (ii). an assessment of alternatives to mitigate or manage the impacts once the risk has become manifested,	Section 4.3 (Table 43), read with Sections 2.17.4 and 2.17.5.



No.	Requirements	Section
	which must be focussed on practicality as well as cost of the implementation; (iii). motivation why the selected alternative is the appropriate approach to mitigate the impact; (iv). a detailed description of how the alternative will be implemented;	
3(d)	costing, calculated using the current value of money and no discounting or net present value calculations included in the determination of the quantum of the liability, including- (i). a cost estimation, which must include- (aa) an explanation of the closure cost methodology; (bb) an auditable calculations of costs per activity or infrastructure; (cc) cost assumptions; (dd) monitoring costs post closure to determine whether the risk is imminent or has manifest are to be included in the assessment as are monitoring costs likely to be incurred during the implementation of the strategy to manage or mitigate the impacts once the risk has become manifest; (ii). where appropriate, a differentiation between capital, operating, replacement and maintenance costs; (iii). cost estimates for operations, or components of operations that are more than 30 years from closure prepared as conceptual estimates within an accuracy of ± 50 per cent. Cost estimates will have an accuracy of ± 70 per cent for operations, or components of operations, 30 or less years (but more than ten years) from closure and ± 80 per cent for operations, or components of operations ten or less years (but more than five years) from closure. Operations with 5 or less years will have an accuracy of ± 90 per cent. Motivation must be provided to indicate the accuracy in the reported number and as accuracy improves, what actions resulted in an improvement in accuracy; and	Section **Error! Reference source not found.** (**Error! Reference source not found.**), read with Sections 2.24.1 and 2.24.3. The ERA liability is additional to the closure quantum in Section 2.24.6.
3(e)	Monitoring, auditing and reporting requirements, which must include requirements prior to the manifestation of the risk and impacts as well as those once the impacts resulting from the manifestation of the risk are realised, inclusive of the approach that will be taken to analyse monitoring results and how these results will be used to inform adaptive or corrective management and/or risk reduction activities.	Section 4.4 (Table 44), read with Section 2.25 (Tables 38 and 39).

4.1 OBJECTIVE OF THE ERA

The ERA determines the potential financial liability associated with managing latent and residual environmental impacts after closure , those that may become known, or continue, once the initial relinquishment criteria have been met , keeping in mind the proposed post-mining land use. Its objectives are to: ensure timeous risk reduction through appropriate interventions; identify and quantify the potential latent environmental risks related to post-closure; detail the approach to managing the risks; quantify the potential liabilities; and outline monitoring, auditing and reporting requirements.

4.2 ASSESSMENT PROCESS AND DESCRIPTION OF LATENT / RESIDUAL RISK

The ERA addresses the residual risks that remain after the FRDCP closure actions are implemented (Section 2.19), rather than the closure-execution risks themselves, typically long-term water quality (ARD / decant), residual seepage and plume migration, cover or landform performance over time, and long-term erosion or subsidence.



Table 42: Summary of latent and residual risks.

Aspect	Latent / residual risk	Significance	Basis / specialist study
Groundwater (Dormant TSF Reclamation)	Continued seepage of sulphate- and manganese-bearing porewater from the residual tailings mass during and after hydraulic reclamation of the dormant Deelkraal I and Kusasalethu TSFs. Residual porewater and contaminated footprint soils persist after removal of the tailings source, with attenuation governed by the existing contaminant plumes extending into the weathered and fractured aquifers.	Medium-Low (Operations); Low (Decommissioning)	TBC Rehabilitation Plan (groundwater management strategy); geohydrological assessment (numerical model of plume migration, pyrite oxidation kinetics); quarterly groundwater monitoring programme through decommissioning and post-closure (minimum 5 years bi-annually).
Groundwater & Surface Water (TSF Closure)	Continued seepage of sulphate- and manganese-bearing porewater into the weathered and fractured aquifers after closure of the Deelkraal II TSF. Pyrite oxidation remains active in the tailings left in place in-situ. Contact water and sediment-laden runoff reports to the Varkenslaagte / Wonderfontein and Loop Spruit systems and downstream to the Boskop and Potchefstroom dams. Residual liability extends well beyond the active aftercare period (~50 year plume attenuation horizon).	Medium to Medium-High (Post-closure)	TBC Rehabilitation Plan (capping and closure design, water balance); surface water baseline and stormwater assessment; geohydrological assessment (FEFLOW numerical model with 50-year predictive horizons); closure water-quality criteria (DWS WUL limits); long-term monitoring programme (quarterly groundwater and surface water; 5-yearly borehole pairs north and south of facility).
Surface Water (Decommissioning)	Release of residual slurry, process water, hydrocarbons and demolition washings to the receiving drainage during the flushing, dismantling and removal of pipelines, pump stations and the return water system, and demolition of plant infrastructure.	Medium-High to High (Decommissioning)	TBC Rehabilitation Plan (decommissioning methodology and sequencing); surface water baseline (Varkenslaagte, Wonderfontein and Loop Spruit receptors); construction and demolition waste management plan; closure water-quality criteria; surface water quality monitoring programme through decommissioning phase.
Surface Water (Post-closure)	Residual poor-quality runoff and seepage from the rehabilitated landform reporting to the receiving environment once active water-quality controls (return water dam, dirty water system) are removed. Risk of non-compliance with closure water-quality criteria during the rainfall-driven runoff period and depending on the performance of the final cover.	Medium (Post-closure)	TBC Rehabilitation Plan (final landform design and closure sequencing); closure water-quality criteria (DWS WUL limits per Table 30); cover design and infiltration analysis; post-closure surface water monitoring (quarterly until criteria are consistently met); contingency passive treatment and containment provisions in ERA liability.



Aspect	Latent / residual risk	Significance	Basis / specialist study
Land Capability & Biodiversity	Irreversible and permanent removal of approximately 430 ha of land from agricultural production beneath the Deelkraal II TSF final landform (three compartments to 65 m maximum height). Irreversible transformation of non-resilient High SEI rocky habitat (>15 years to restore <50% of species composition and functionality) and complete loss of wetland habitat (HGM 1, 2, 4), ecosystem services and hydrological function in systems classified Critically Endangered and Not Protected.	Medium-High to High (Permanent)	TBC Rehabilitation Plan (post-closure land use, GISTM stability monitoring); terrestrial ecology and wetland specialist assessments (SEI and HGM classifications); biodiversity offset strategy; confirmed via Appendix 4 item 3(e) , post-closure land use constrained to non-agricultural use (e.g. renewable energy generation on degraded landform; conservation use on rehabilitated wetland buffers).
Visual / Landscape Character	Permanent alteration of landscape character and of views from the Deelkraal Passive Recreation Area, the R501 trunk route (~15 km visibility), the N12 national highway (~9 km visibility), and the mine villages (Elandsridge, Deelkraal, Wedela). The rehabilitated TSF final landform (up to 65 m high, crest ~1 679 mamsl) remains a permanent landscape feature.	Medium to Medium-High (Permanent)	TBC Rehabilitation Plan (incremental rehabilitation and final landform profiling); Visual Impact Assessment (viewshed analysis from sensitive receptors); landscape character and design considerations; alternative final heights under investigation (55 m / 45 m / 35 m, Old Savuka footprint).
Social / Livelihood & Land Use	Post-closure safety hazards and restricted access to the rehabilitated TSF and residual water bodies during the vegetation establishment and aftercare period (typically 3–5 years minimum). Uncertainty over permanent post-closure land use and tenure. Loss of grazing for an estimated 200–400 cattle plus goats, pigs and poultry, and loss of subsistence cultivation land used by informal occupiers and surrounding farming communities.	Medium-High (Post-closure / Permanent)	TBC Rehabilitation Plan (progressive rehabilitation, access control, land-use confirmation, livelihood restoration per IFC PS5); Social Impact Assessment and baseline livelihood survey; post-closure safety fencing and signage programme; long-term stability monitoring under GISTM; grievance mechanism maintenance through aftercare period; alternative grazing land identification and tenure confirmation before access restrictions are imposed.

4.3 MANAGEMENT ACTIVITIES

Table 43 sets out the ongoing management strategies and measurable corrective-action triggers for each latent and residual risk identified in the closure planning for Harmony West Wits. The management strategies are drawn from The Biodiversity Company's Rehabilitation Plan (TBC, 2026) and specialist assessments; the corrective-action triggers reference the closure criteria defined in Table 30 and are tied to monitoring and performance assessment schedules.

Section 2.16.3 of this report provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken. Section 2.16.3 also includes identified mitigation measures which, once implemented successfully, will result in the avoidance or acceptable reduction of the associated impact.

Table 43: Management strategies and corrective-action triggers for latent and residual risks

Latent/Residual Risk Aspect	Ongoing Management Strategy	Corrective-Action Trigger(s)
Groundwater (Dormant TSF Reclamation)	Ongoing quarterly groundwater monitoring at all down-gradient boreholes from Deelkraal I and Kusasalethu. Maintain records of porewater quality (sulphate, manganese, pH, TDS) and update the FEFLOW numerical model at each monitoring event. Progressive rehabilitation and recompaction of the vacated footprints as reclamation advances to limit infiltration and hydraulic connection to the mined-out cavity.	Porewater sulphate or manganese concentrations exceeding the attenuated plume trajectory by >20% in two consecutive quarters → escalate and review model assumptions; trigger update to closure water-quality criteria and confirm contingency cut-off trench design [ERA escalation]. Footprint rehabilitation completion delayed beyond the planned schedule → reassess infiltration risk and modify cover design if necessary. Attenuation targets not met by end of decommissioning phase (typically 2–3 years post-cessation) → transition to post-closure monitoring regime with extended monitoring interval (5–10 years depending on plume location).
Groundwater & Surface Water (TSF Closure)	Capping and shaping of the Deelkraal II TSF to shed water and minimise infiltration into the unsaturated zone. Final landform design to be free-draining and erosion-resistant per DWS BPG G5. Maintenance of underdrainage and seepage collection systems until demonstrated porewater quality compliance with closure water-quality criteria (sulphate, manganese, pH per WUL limits). Quarterly groundwater and surface water monitoring post-closure using minimum four borehole pairs (two shallow, two deep; north and south of facility) with FEFLOW model updates. Long-term monitoring extends ~50 years post-closure during plume attenuation. Hold cut-	Cover infiltration or ponding observed during rainy season inspections → repair erosion, recompact, or reseal exposed areas within 30 days. Porewater quality non-compliance with closure criteria (sulphate >600 mg/L, Mn >0.1 mg/L, pH <6.5) in two consecutive quarters at either north or south borehole pair → escalate to contingency remediation; activate cut-off trench design review or passive treatment system design [ERA escalation]. Model predictions deviate by >15% from measured porewater data at any borehole → update FEFLOW calibration and revise long-term



Latent/Residual Risk Aspect	Ongoing Management Strategy	Corrective-Action Trigger(s)
	off trench and passive treatment contingencies in the ERA liability.	migration trajectory; adjust monitoring frequency if warranted. Post-closure monitoring interval >24 months without completed sampling event → reinstate quarterly monitoring until compliance demonstrated for 2 consecutive years.
Surface Water (Decommissioning)	Prior to decommissioning of pipelines, pump stations and return water system, flush and drain all vessels to the process circuit. All dismantling work conducted over drip trays and within bunded areas to contain residual slurry and hydrocarbon contamination. Dirty water containment system retained and operational throughout decommissioning and until all contact-water sources removed. Contaminated soil classified, excavated and disposed at a licensed waste facility with disposal certificates retained. Continuous surface water quality monitoring (weekly or event-based) at the receiving drainage during decommissioning activities.	Spill, seepage or uncontrolled discharge to surface water detected during decommissioning activities → activate immediate response; contain discharge, classify contamination, and dispose off-site; notify WUL-holder and competent authority within 24 hours. Surface water quality exceedance detected at receiving water monitoring point → cease demolition activity, investigate source, contain and remediate within 48 hours [ERA escalation if persistent]. Completion of decommissioning delayed beyond scheduled phase → extend monitoring coverage and hold contingency for extended containment if necessary.
Surface Water (Post-closure)	Demonstrate compliance with closure water-quality criteria (Table 30) before final decommissioning of the dirty water system. Final landform capping design to limit infiltration and acid generation from residual pyrite in tailings left in-situ. Quarterly surface water quality monitoring post-closure (runoff from rehabilitated slopes and seepage from TSF base) with defined corrective-action thresholds. Hold passive treatment or containment contingency in the ERA liability if criteria not met.	Runoff or seepage quality fails closure criteria (sulphate, Mn, pH, TDS per WUL limits) at any monitored location in two consecutive quarterly events → escalate to contingency design review; activate passive treatment or constructed wetland system if required by the WUL-holder [ERA escalation]. Cover performance failure observed (ponding, seepage breakthrough, erosion gullies) → repair or reseal within 30 days; update design if failure pattern suggests systematic issue. Transition from post-monsoon (wet) to pre-monsoon (dry) period without achieved compliance → revise contingency strategy and liaise with WUL-holder on extended monitoring and treatment options.



Latent/Residual Risk Aspect	Ongoing Management Strategy	Corrective-Action Trigger(s)
Land Capability & Biodiversity	Permanent post-closure land use set for the TSF footprint to a use that the rehabilitated capability (non-arable, low grazing potential) can support, e.g. renewable energy generation, conservation cover. Avoided altogether or minimised (200 m buffer, layout optimisation) impacts to High SEI habitat, Class 1 Ridges and HGM 1, 2, 4 wetlands. Biodiversity and wetland offsets secured as measure of last resort for unavoidable loss, authorised under the applicable water use authorisation. Rehabilitation of the 256.83 ha of already-transformed land to grazing capability. All retained and hydrologically-connected wetlands rehabilitated and monitored toward Recommended Ecological Category per HGM assessment. Residual loss recorded as permanent outcome in FRDCP and ERA; differentiated land-use objectives agreed per rehabilitation domain with the competent authority and affected landowners.	Vegetation cover on rehabilitated TSF slopes or vacated footprints <70% basal cover at the end of aftercare period → extend maintenance and re-seeding for an additional 2–3 years per Table 30 target. High SEI habitat avoided during operations? → document avoidance in compliance register; if exceedance detected during operational audit, escalate to offset obligations [compliance escalation]. Retained wetlands (HGM 3, 5, 6) show deterioration in PES category or inundation changes from baseline → adjust management regime; investigate hydrological changes and implement corrective action per WUL and HGM specialist recommendations [ERA escalation if irreversible damage detected]. Alternative post-closure land use proposed after site transfer → subject to competent-authority approval; document as amendment to closure outcome; ensure new use is compatible with residual liability management.
Visual / Landscape Character	Incremental rehabilitation of TSF side slopes and crest during operational phase to allow blending with surrounding landform. Final landform shaped to natural, rounded profile (avoiding engineered terraces) and revegetated with indigenous grasses established from sterile nursery stock. Vegetation establishment monitored against basal cover targets (Table 30: ≥70% by end of aftercare). Alternative final heights (55 m / 45 m / 35 m, or Old Savuka / DF5 footprints) evaluated during planning to lower visual impact if feasible. Post-closure landscape visual inspection conducted annually or after significant rainfall events to assess slope stability and vegetation health.	Vegetation establishment <70% basal cover at end of aftercare period (typically year 5 post-closure) → extend maintenance, reseeding and erosion repair for additional 2–3 years per Table 30 target. Slope failure, gully erosion or mass movement observed → immediate stabilisation and repair; investigate causal factors (rainfall, design inadequacy, cover failure) and modify design if required [geotechnical specialist assessment required]. Visual inspection reveals unexpected landscape degradation (e.g. revegetation failure, desiccation cracking, subsidence) → conduct site audit, diagnose cause and implement corrective management (additional irrigation, cover thickness, slope angle



Latent/Residual Risk Aspect	Ongoing Management Strategy	Corrective-Action Trigger(s)
		adjustment) within 30 days of detection. Proposed changes to final height or profile by proponent or stakeholders → subject to visual re-assessment and competent-authority approval; must demonstrate equivalent or better visual impact mitigation.
Social / Livelihood & Land Use	Progressive rehabilitation undertaken throughout operational phase to avoid deferring all closure work to post-closure. Fencing and signage installed and maintained at the rehabilitated TSF and residual water bodies with access control protocols. Long-term stability monitoring conducted under GISTM including post-closure regime to assure safety for public access after release of land. IFC PS5 livelihood restoration applied irrespective of tenure status; alternative grazing land identified and secured before access is lost. Rehabilitated land released to grazing incrementally as vegetation cover criteria are met (≥70% basal cover per Table 30). Closure timelines, land-use constraints and post-closure safety measures communicated clearly and in accessible language to affected communities. Closure-stage grievance mechanism maintained throughout aftercare period.	Public access to rehabilitated TSF or residual water bodies documented before vegetation cover criteria met (baseline 3–5 years post-closure) → reinstate access control fencing and signage; escalate to WUL-holder and competent authority [safety escalation]. Vegetation cover <70% basal cover by end of planned aftercare period → extend access restrictions and maintenance/re-seeding until target met; communicate revised timeline to stakeholders. Informal occupiers or livestock present on restricted areas during aftercare period → engage community liaison; resolve tenure or access issues through grievance mechanism; escalate unresolved disputes to competent authority [community escalation]. Stability monitoring (GISTM) identifies slope movement, subsidence or safety hazard → conduct geotechnical assessment; restrict access until hazard mitigated; update post-closure land-use compatibility assessment [ERA escalation]. Stakeholder communication fails to achieve consensus on post-closure land use or safety measures → refer to competent authority for mediation and final determination per closure approval conditions.

4.4 MONITORING, AUDITING AND REPORTING

Monitoring of the latent and residual risks identified in Section 4.2 is carried within the consolidated monitoring plan in Section 2.25 (Table 39) and is not repeated here. The parameters, standards, locations, frequencies and



reporting lines applicable to each residual risk are given in that table; the corrective-action triggers and the management responses initiated on exceedance are given in Table 43.

Two monitoring regimes apply. Prior to manifestation of a risk, monitoring is surveillance-based and steps down in frequency as performance is demonstrated: groundwater quality and level, seepage and underdrainage flow, landform settlement and stability, vegetation cover and condition, alien invasive encroachment, surface water quality at the compliance points, and the radiological dose assessment, each at the frequency set out in Table 39. Once a risk has manifested , that is, once a trigger in Table 44 is exceeded and confirmed on re-sampling , monitoring reverts to the intensive frequency stated for that parameter, the affected aspect is investigated by the relevant specialist, and the management alternative selected in Table 43 is implemented and monitored to closure of the finding.

Monitoring results are analysed as trends against the closure baseline and the applicable standard rather than as individual determinations, so that a sustained adverse trend triggers investigation before a compliance limit is breached. Results are reported quarterly to the Environmental Manager, annually to the competent authority through the Environmental Management Programme compliance audit, and are tabled at the annual financial provision review under Regulation 11 of GN R1147, where they inform any adjustment to the residual risk register, the management strategies and the ERA quantum.

Auditing of the ERA follows the audit programme in Section 2.25 (Table 38). The latent and residual risk register is reviewed annually and independently audited as part of the annual financial provision determination. Post-closure, monitoring and reporting obligations continue on the reduced schedule stated in Table 39 until the relinquishment criteria in Section 2.23 have been demonstrated and the competent authority has confirmed that the obligation may be discharged



Table 44: Monitoring, auditing and reporting.

Aspect	Parameter	Frequency	Corrective-action trigger	Period
Groundwater (Dormant TSF Reclamation)	Porewater quality: sulphate, manganese, iron, pH, TDS, conductivity; water level; hydraulic gradient; contaminant plume position (via numerical model)	Quarterly (Years 0–5); bi-annual (Years 5–10); annual (Years 10–30+)	Sulphate or Mn >20% deviation from predicted attenuation trajectory in 2 consecutive quarters → review model; trigger cut-off trench design if migration accelerates [escalation to WUL-holder]	30 years (or until criteria consistently met for 5 consecutive years; minimum through 2026 + 30 years to ~2076)
Groundwater & Surface Water (TSF Closure)	Groundwater: porewater quality (sulphate, Mn, Fe, pH, TDS, conductivity, As, U, SO_4^{2-}); water level; hydraulic head; potentiometric surface (min 4 borehole pairs: 2 shallow, 2 deep, north and south of facility). Surface water: runoff/seepage quality (same suite as porewater); sediment load; pH; dissolved oxygen; ecological condition (as per DWS WUL); flow rate during rainfall events.	Groundwater: Quarterly (Years 0–5); bi-annual (Years 5–20); annual (Years 20–50+). Surface water: Quarterly (Years 0–5); annual (Years 5–50+); event-based sampling during major rainfall if infrastructure operational.	Groundwater: Porewater non-compliance with WUL criteria (sulphate >600 mg/L, Mn >0.1 mg/L, pH <6.5, As >10 µg/L, U >30 µg/L) for 2 consecutive quarters at north or south pair → escalate to contingency design; activate cut-off trench or passive treatment system [ERA escalation]. Surface water: Non-compliance at receiving water body for 2 consecutive quarters → escalate to WUL-holder; activate contingency if trend toward criteria breach detected [ERA escalation].	50 years post-closure (to ~2098) or until porewater quality remains <50% of WUL limits for 5 consecutive years
Surface Water (Decommissioning)	Surface water quality: runoff and seepage at receiving drainage (Varkenslaagte / Wonderfontein / Loop Spruit): pH, conductivity, TDS, turbidity, suspended solids, sulphate, manganese, iron, hydrocarbons (TPH, PAH), heavy	Weekly or event-based during decommissioning activities (Years −1 to +2); transition to quarterly monitoring (Years 2–5 post-closure) once dirty water system decommissioned and compliance demonstrated	Spill or uncontrolled discharge detected → immediate response; containment and remediation within 48 hours [escalation to WUL-holder and competent authority within 24 hours]. Water quality exceedance of WUL	Through decommissioning phase (~2–3 years), then quarterly for 5 years post-closure (Years 2–5 + 5 years = Year 7); contingency monitoring continues if criteria not met



Aspect	Parameter	Frequency	Corrective-action trigger	Period
	metals (Pb, Zn, Cu, Ni); biological oxygen demand (BOD); ecological condition (macroinvertebrates, fish); flow monitoring during rainfall events.		criteria at receiving point → cease demolition if active discharge; investigate source and remediate within 48–72 hours. Persistent non-compliance after decommissioning (2+ quarters non-compliance post-closure) → activate passive treatment or containment contingency [ERA escalation].	
Surface Water (Post-closure)	Surface water quality: TSF runoff and seepage (same suite as decommissioning: pH, conductivity, TDS, sulphate, Mn, Fe, hydrocarbons, heavy metals, BOD); sediment grain size and contamination; ecological condition (macroinvertebrates, fish, periphyton); cover integrity visual inspection; erosion/gullying survey.	Quarterly (Years 0–5 post-closure: water quality samples at 4–6 week intervals, visual inspections at each visit); annual (Years 5–20); event-based sampling within 48 hours of rainfall >50 mm	Runoff/seepage quality non-compliance with WUL criteria for 2 consecutive quarters → escalate design review; activate passive treatment design if persistent. Cover erosion or ponding detected (visual inspection) → repair within 30 days; investigate causal factors. Trend analysis: if 3-year moving average shows deterioration toward criteria → adjust contingency strategy [ERA escalation].	Minimum 20 years post-closure (to ~2068), or until criteria consistently met for 3 consecutive years; contingency monitoring as needed
Land Capability & Biodiversity	Vegetation cover: basal cover % and species composition by rehabilitation domain; LAI (Leaf Area Index) optical survey or allometric biomass; alien invasive cover %; erosion severity (gully depth, rill density); soil compaction and bulk density (0–100 mm, 100–300 mm depths).	Vegetation: Annually at end of growing season (March/April, southern hemisphere) during aftercare (Years 0–5); then every 2–3 years (Years 5–10); then 5-yearly thereafter (Years 10–25). Wetland: Annually (Years 0–5); then every 2 years (Years 5–15); then 5-yearly (Years 15+). Alien	Basal cover <70% at end of aftercare period (Year 5) → extend maintenance and re-seeding for additional 2–3 years. Alien invasive cover >10% at any domain → intensify control; assess control method effectiveness. Wetland PES category declines from baseline → investigate	Vegetation aftercare: 5–7 years post-closure (Years 0–5 mandatory; extension to Years 7 if criteria not met). Wetland monitoring: minimum 15 years (through relinquishment assessment window); long-term



Aspect	Parameter	Frequency	Corrective-action trigger	Period
	Wetland habitat: HGM assessment (PES category for retained HGM 3, 5, 6); hydrological condition (inundation depth, duration, seasonal pattern); species richness and composition.	control effectiveness: monitored during each vegetation survey.	hydrological or land-use change; implement corrective management. Erosion severity class increases (e.g. from low to moderate) over consecutive surveys → slope redesign or enhanced maintenance [specialist assessment required].	(25+ years) if PES improvement toward REC ongoing
Visual / Landscape Character	Slope profile and geometry: annual photographic survey from fixed viewpoints (Deelkraal Passive Recreation Area, R501, N12, mine villages,4 primary receptors + 2 secondary); slope angle profiling at cross-sections; vegetation cover and colour progression; evidence of gullying, slumping, or subsidence; landform blending visual assessment.	Annual site visit and photography (Years 0–10 post-closure); then every 2–3 years (Years 10–25); professional visual assessment every 5 years. Fixed viewpoint photography recorded at same time, location, and lens to enable temporal comparison.	Gully erosion >0.5 m depth or rills >5 mm depth → repair within 30 days; assess infiltration and modify cover if recurring. Vegetation cover fails to establish (basal <50% by Year 3) → implement remedial seeding or irrigation. Slope slumping or subsidence detected → cease public access; conduct geotechnical assessment and stabilisation design. Visual degradation trend identified over consecutive 5-year assessments (e.g. slope colour change, increased erosion visible) → escalate to design review [specialist assessment].	Minimum 15 years post-closure (Years 0–15); longer if vegetation establishment ongoing or geotechnical monitoring active
Social / Livelihood & Land Use	Community livelihood monitoring: livestock census (head count, species) on rehabilitated grazing areas; crop yield and area under cultivation (if applicable); community health survey	Community monitoring: annual stakeholder engagement (focus group or survey; Years 0–5) + 3-yearly health survey (Years 0–15). Site safety: annual inspection + visual assessment at each	Livestock census below pre-closure baseline by >20% → investigate access barriers or pasture quality; adjust grazing release phasing. Crop yield <80% of pre-closure baseline → assess	Community monitoring: Years 0–15 post-closure (aftercare through relinquishment assessment). Health survey: 3-yearly for 15 years (4–5 surveys). Site safety: Years 0–10 (aftercare through



Aspect	Parameter	Frequency	Corrective-action trigger	Period
	(respiratory, gastro-intestinal illness prevalence) at 3-yearly intervals; grievance register (access, safety, livelihood impacts); stakeholder feedback on closure objectives and land-use satisfaction. Site safety: annual safety audit (fencing integrity, signage, access control, residual water body hazards); incident register (injuries, trespass, unauthorised use); GISTM stability monitoring (if infrastructure remains).	community engagement visit (Years 0–10) + annual GISTM monitoring through aftercare. Grievance mechanism: ongoing (monthly escalation reviews).	soil capability; modify post-closure land-use plan if necessary. Health survey shows elevated illness prevalence attributable to site → escalate public health investigation [health authority and WUL-holder escalation]. Safety audit identifies fence breaches, missing signage, or unauthorised access → repair within 14 days; increase monitoring frequency if recurring. Grievance backlog (unresolved issues >90 days) → escalate to senior management and competent authority [stakeholder escalation].	public release); ongoing thereafter if land use or infrastructure constraints remain. GISTM monitoring: through closure and indefinite if landform remains under community use.



5 CONCLUSION AND RECOMMENDATIONS

This Final Rehabilitation, Decommissioning and Closure Plan has been prepared for Randfontein Estates Limited, a subsidiary of Harmony Gold Mining Company Limited, in respect of the proposed Deelkraal II Tailings Storage Facility and associated infrastructure at the West Wits operations near Carletonville, in accordance with section 24P of the National Environmental Management Act, 1998 (Act 107 of 1998) and Appendix 4 to the Financial Provisioning Regulations, 2015 (GN R1147). It accompanies the environmental authorisation application and is the first iteration of the plan; it will be reviewed, assessed and adjusted annually in terms of Regulation 11, and amended as the design, the operating experience and the monitoring record develop.

The closure vision is to return the disturbed footprint to a safe, stable, non-polluting and self-sustaining condition that supports the agreed post-mining land use of grazing, that is consistent with the surrounding landscape and land capability, and that can be relinquished without residual active management obligations or an unfunded liability. The objectives, targets and criteria that give effect to that vision are set out in Section 2.17.3, the post-mining land use per rehabilitation domain in Section 2.18, and the relinquishment criteria and their auditable indicators in Section 2.23.

The closure strategy has been selected through the evaluation of alternatives in Section 2.17.4 and is motivated in Section 2.17.5. It comprises rehabilitation of the Deelkraal II TSF to a free-draining, erosion-resistant and vegetated final landform; removal of the reclaimed dormant Deelkraal I and Kusasalethu TSF footprints together with stripping or treatment of residual contaminated footprint material; dismantling and removal of the reclamation pump stations, plant upgrades, slurry and process water pipelines, powerlines and ancillary infrastructure, with rehabilitation of the servitudes and access roads; decommissioning of the three return water dams (the main Return Water Dam, RWD2 and RWD3) and the stormwater works and reinstatement of the clean and dirty water separation to the pre-development drainage regime; and a period of maintenance, monitoring and aftercare sufficient to demonstrate the relinquishment criteria. The closure actions are specified by domain and phase in Section 2.19 and scheduled against the deposition programme in Section 2.20.

The environmental risk assessment in Section 2.16 concluded that the closure-phase risks can be reduced to acceptable levels through implementation of the closure actions, with the exception of the residual impacts that persist beyond the aftercare period. Those residual and latent impacts , principally the continued seepage of sulphate- and manganese-bearing porewater to the weathered and fractured aquifers, which is modelled to attenuate to below the Water Use Licence limits over approximately fifty years; the long-term physical stability of the rehabilitated landform; the permanent alteration of landscape character; the permanent loss of agricultural land capability and of High SEI terrestrial and wetland habitat within the footprint; and post-closure safety, access and land-use uncertainty , are assessed, managed and separately costed in the Environmental Risk Assessment in Section 4, and are not included in the quantum reported below.

The closure cost was estimated by MineLock Environmental Engineers (Pty) Ltd in accordance with the DMR Guideline, using master rates escalated to September 2026 as set out in Section 2.24.4 and applied within the battery limits defined in Section 2.24.2 (MineLock, 2026; Appendix 1). The quantum of financial provision for closure at the determination date, taken as one year into construction, is R61 217 472.05 (incl. VAT), equal to the R53 232 584.39 (excl. VAT) reported in the EIA Report (Rev. 1), as detailed in Section 2.24.6.

The knowledge gaps and assumptions on which this plan rests are recorded in Sections 2.17.7 and 2.22, together with the ongoing research, trials and verification work intended to close them. The monitoring, auditing and reporting programme through which performance against the closure objectives will be measured, and through which the plan will be adapted, is set out in Section 2.25.

On the basis of the specialist findings, the risk assessment and the closure actions committed to in this plan, it is concluded that the proposed Deelkraal II TSF and associated infrastructure can be decommissioned, rehabilitated and closed to a condition that meets the relinquishment criteria in Section 2.23 and supports the intended post-mining land use, and that the financial provision reported in Section 2.24.6 is adequate to discharge the closure liability that will exist at the end of the first year of construction.



Appendix 1: West Wits DMR Closure Costing (MineLock Environmental Engineers, 2026)